VOL. 6 NO. 17
September 15, 1981

Energy Research Abstracts

Abstracts 24841-26733

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications which are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the energy data base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON. Descriptions of these current awareness publications which are supported either directly or indirectly by the DOE, appear below.

PUBLICATIONS OF THE TECHNICAL INFORMATION CENTER

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following: programmatic efforts; legislative, regulatory, and other legal aspects; social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $4.00, foreign $5.00 per copy; annual cumulative index, domestic $6.00, foreign $7.50 per copy. The annual subscription price is $44.00 for domestic subscribers and $55.00 for foreign subscribers.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. Indexes are cumulated semiannually and annually. *ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues including a semiannual index and an annual index is $184.00 for domestic subscribers and $230.00 for foreign subscribers. The semiannual and annual indexes will also be available separately to subscribers. The cost for the semiannual index is $18.00 (domestic) or $22.50 (foreign); the annual index is $33.00 (domestic) or $41.25 (foreign). A single issue costs $5.55 (domestic) or $6.95 (foreign).

The following publications are available to the public on a subscription basis from the National Technical Information Service (NTIS), Springfield, Virginia 22161. The annual subscription rate for one volume (calendar) year (12 issues plus cumulative index) is $45.00 for domestic subscribers and $90.00 for subscribers outside the North American Continent. A single issue is $6.00 (domestic) and $12.00 (outside the North American Continent).

Current Energy Patents (CEP)

A monthly publication providing abstracting and indexing coverage of the international patent literature, including patent applications, that concerns any aspect of energy production, conservation, and utilization. Available as PB81-902800.

Energy Conservation Update (ECU)

A monthly abstract journal devoted to current information on energy conservation in buildings, transportation and propulsion, and industry; waste processing plants and equipment; energy storage; energy conversion; advanced automotive systems; combustion systems; power cycles; synthetic fuels; and power transmission. Available as PB81-914800.

Energy and the Environment (EAE)

A monthly abstract journal devoted to information on the impacts of energy-related activities and radioactive and nonradioactive pollutants on the environment. Available as PB81-914900.

Fossil Energy Update (FEU)

A monthly abstract journal devoted to information on the processing and use of fossil fuels. Available as PB81-914600.

Fusion Energy Update (CFU)

A monthly abstract journal devoted to information on controlled thermonuclear research. Available as PB81-915300.

Geothermal Energy Update (GEU)

A monthly abstract journal devoted to information on the exploration and development of geothermal resources. Available as PB81-914700.

Solar Energy Update (SEU)

A monthly abstract journal devoted to information on the utilization of solar, tidal and wind energy. Available as PB81-914500.

Synthetic Fuels Update (SFU)

A monthly abstract journal devoted to information on coal gasification; coal liquefaction; other coal processing; biomass conversion to fuel; shale oil and tar sand bitumen production; hydrogen fuels; other hydrocarbon fuels; alcohol fuels; and inorganic hydrogen compound fuels. Available as PB81-902700.

INTERNATIONAL ENERGY PUBLICATIONS

Atomindex (Published in cooperation with the Technical Information Center by the International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria)

A semimonthly abstract journal devoted to information on nuclear science and technology. Through an exchange agreement, IAEA/INIS provides all non-U. S. nuclear information of *Atomindex* to TIC for inclusion in the DOE/RECON Data Base; in turn, TIC provides all U. S. nuclear information to IAEA/INIS for inclusion in *Atomindex*. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

Coal Abstracts (Published in cooperation with the Technical Information Center by the International Energy Agency, IEA Coal Research, London, England)

A monthly abstract journal devoted to information on coal. Through an exchange agreement, IEA Coal Research provides all non-U. S. coal information of *Coal Abstracts* to TIC for inclusion in the DOE/RECON Data Base; in turn, TIC provides all U. S. coal information to IEA Coal Research for inclusion in *Coal Abstracts*. *Coal Abstracts* is available to Department of Energy components and contractors from. the Technical Information Center. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England for 100 pounds sterling per year.

International Copyright, © U. S. Department of Energy, 1979, under the provisions of the Universal Copyright Convention.
United States copyright is not asserted under the United States Copyright Law, Title 17, United States Code.

energinfo ERA

Vol. 6, No. 17
ISSN: 0160-3604
CODEN: ERABD
September 15, 1981

ENERGY RESEARCH ABSTRACTS

ABOUT THE TECHNICAL INFORMATION CENTER

The Technical Information Center, as the national information center for the Department of Energy, manages, publishes, and disseminates scientific, technical, and practical energy information acquired from worldwide sources. It builds and maintains energy information data bases used to prepare abstracting journals, bibliographies, and literature searches. The data bases are also searchable via the Department's on-line retrieval system, DOE/RECON. This information is provided to DOE program offices and contractors; scientists; engineers; educational, commercial, and industrial communities; and the general public. The Technical Information Center conducts an active announcement and marketing program. It establishes policy and administers control of an inventory and registry for DOE publications. The Center also develops and evaluates new and effective information systems and services as required by scientific and technical management within the Department of Energy.

UNITED STATES DEPARTMENT OF ENERGY

James B. Edwards
Secretary

William S. Heffelfinger
Assistant Secretary
Management and Administration

Joseph G. Coyne
Manager
Technical Information Center

ABOUT *ENERGY RESEARCH ABSTRACTS*

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers, and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, conservation, safety, environmental impacts, and regulation.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Federal, state, and municipal agencies concerned with energy development, conservation, and usage may obtain *ERA* free of charge. Inquiries should be directed to the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

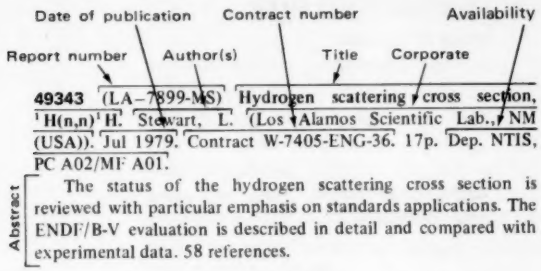
ERA is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues including a semiannual index and an annual index is $184.00 for domestic subscribers and $230.00 for foreign subscribers. The semiannual and annual indexes are also available separately to subscribers. The cost for the semiannual index is $18.00 (domestic) or $22.50 (foreign); the annual index is $33.00 (domestic) or $41.25 (foreign). A single issue costs $5.55 (domestic) or $6.95 (foreign).

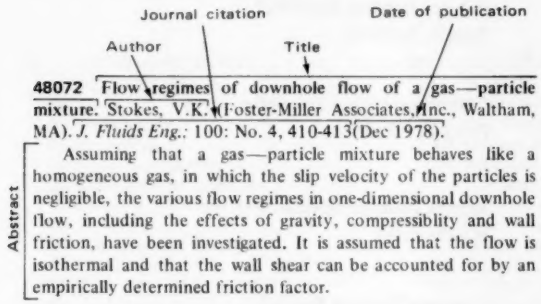
Published by the **United States Department of Energy, Technical Information Center**
P. O. Box 62, Oak Ridge, Tennessee 37830

HOW TO USE *ENERGY RESEARCH ABSTRACTS*

•ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.


Date of publication
Contract number
Availability
Report number
Author(s)
Title
Corporate
49343 (LA–7899-MS) Hydrogen scattering cross section, ¹H(n,n)¹H. Stewart, L. (Los Alamos Scientific Lab., NM (USA)). Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.
Abstract
The status of the hydrogen scattering cross section is reviewed with particular emphasis on standards applications. The ENDF/B-V evaluation is described in detail and compared with experimental data. 58 references.


Journal citation
Date of publication
Author
Title
48072 Flow regimes of downhole flow of a gas—particle mixture. Stokes, V.K. (Foster-Miller Associates, Inc., Waltham, MA). J. Fluids Eng.: 100: No. 4, 410-413 (Dec 1978).
Abstract
Assuming that a gas—particle mixture behaves like a homogeneous gas, in which the slip velocity of the particles is negligible, the various flow regimes in one-dimensional downhole flow, including the effects of gravity, compressiblity and wall friction, have been investigated. It is assumed that the flow is isothermal and that the wall shear can be accounted for by an empirically determined friction factor.

•INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. These indexes are cumulated semiannually and annually. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

•Corporate Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

49343 (LA–7899-MS) Hydrogen scattering cross section, ¹H(n,n)¹H. Stewart, L. **(Los Alamos Scientific Lab., NM (USA))**. Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Advanced laser fusion target fabrication research and development proposal, 4:48249 (LA–7619-P)
Hydrogen scattering cross section, ¹H(n,n)¹H, 4:49343 (LA–7899-MS)

•Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Stewart, L., Hydrogen scattering cross section, ¹H(n,n)¹H, 4:49343 (LA–7899-MS)
Stewart, M.D., *See* McInroy, J.F., 4:49280
Stewart, W., *See* Dean, J.W., 4:48543
Stimson, J., Reproduction, growth, and survival of Enewetak corals, 4:49200 (NVO–0703-1, pp 56-59)

•Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles and informative phrases, or both, specific to these entries are arranged alphabetically under the entries.

HYDROGEN I TARGET
Neutron Reactions
Hydrogen scattering cross section, ¹H(n,n)¹H (Above 100 keV, review), 4:49343 (LA–7899-MS)
HYDROGEN NITRATES
See NITRIC ACID
HYDROLOGY
Research Programs
Inventory of advanced energy technologies and energy conservation research and development: 1976-1978. Volume II. Prepared for the Committee on Science and Technology, U.S. House of Representatives, 96*th* Congress, 4:48749.

•Contract Number Index

DOE technical report literature is indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos Scientific Lab., NM (USA)**	
	3:49698	LA-tr–78-45
	3:49857	LA–7224T
	3:49863	LA–7235-MS
W-7405-ENG-48	**California Univ., Livermore (USA). Lawrence Livermore Lab.**	
	3:49386	UCRL–52456
	3:49431	UCRL–52405

•Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience.

LA-		
7899-MS	**4:49343**	**Dep. NTIS, PC A02/MF A01**
LA-tr-		
78-69	**4:48158**	**Dep. NTIS, PC A03/MF A01**

STAFF OF ENERGY RESEARCH ABSTRACTS

Editor
David E. Bost

Assistant Editors
Lee M. Thompson
Charles E. Stuber

Associate Editors for Fossil Energy
M. Catherine Grissom
D. Lamar Cason
Dorothy M. Chertok
Lynda H. Kern
Betty L. McDowell
Lorne T. Newman
Donna G. Powers
Amy T. Tamura

Associate Editors for Physical Sciences and Engineering
Robert C. Kelly
Jack Blanshei
Donato DiGregorio
Lisbeth C. Lieberman
W. Hugh Kinser
George H. Thoeming

Associate Editors for Environment and Life Sciences
Sidney F. Lanier
E. Ray Bedford
Polly S. Blackburn
Jane G. Buchanan
Robert J. Chertok
Kathleen R. Meyer
Axel C. Ringe
David L. Snow

Associate Editors for Nuclear Energy
Henry D. Raleigh
David C. Cunningham
James R. Dulaney
Lawrence T. Whitehead
Milton O. Whitson

Associate Editors for Conservation and Solar Energy
Lila B. Smith
Dona C. Keller
Mona H. Raridon
Jerry M. Thomas
Martha C. Wilson
Larry E. Williams

Report Evaluator
John H. Mitchell

Subject Heading Specialist
Julia S. Redford

Corporate Author Specialist
Patsy L. Hendricks

Report Number Specialist
Wanda Parks

Contract Number Specialist
William D. Matheny

Cataloging and Digitizing Coordinator
J. Paul Meredith

Computer Processing Coordinator
Billy H. Brady

Publishing Coordinator
Irene D. Keller

International Copyright, © U. S. Department of Energy, 1979, under the provisions of the Universal Copyright Convention. United States copyright is not asserted under the United States Copyright Law, Title 17, United States Code.

Communication concerning the editorial policy and content of *Energy Research Abstracts* should be addressed to the Editor, *Energy Research Abstracts*, Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts.* The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

01 COAL AND COAL PRODUCTS
- 04 Processing
- 05 By-Products
- 06 Properties
- 08 Waste Management
- 09 Environmental Aspects
- 10 Reserves and Exploration
- 20 Mining
- 30 Transport and Handling
- 40 Combustion
- 50 Marketing and Economics
- 60 Health and Safety
- 70 Regulations

02 PETROLEUM
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling and Production
- 04 Processing
- 05 Products and By-Products
- 06 Health and Safety
- 07 Marketing and Economics
- 08 Waste Management
- 09 Environmental Aspects
- 10 Policy, Legislation, and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Storage
- 50 Combustion

03 NATURAL GAS
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling, Production, and Processing
- 04 Products and By-Products
- 05 Health and Safety
- 06 Marketing and Economics
- 07 Waste Management
- 08 Environmental Effects
- 09 Artificial Stimulation, Plowshare, etc.
- 10 Policy, Legislation, and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Combustion
- 50 Storage

04 OIL SHALES AND TAR SANDS
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 03 Drilling, Fracturing, and Mining
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 06 Direct Uses and By-Products
- 07 Health and Safety
- 08 Marketing and Economics
- 09 Waste Research and Management
- 10 Environmental Aspects
- 20 Regulations

05 NUCLEAR FUELS
- 01 Reserves
- 02 Exploration
- 03 Mining
- 04 Feed Processing
- 05 Enrichment
- 06 By-Products
- 07 Fuels Production and Properties
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 10 Marketing and Economics
- 20 Waste Management
- 30 Environmental Aspects
- 40 Health and Safety
- 50 Regulations

06 FUSION FUELS
- 01 Sources
- 02 Processing
- 03 By-Products
- 04 Transport and Storage
- 05 Health and Safety
- 06 Regulations and Policy
- 07 Waste Management
- 08 Properties
- 09 Environmental Aspects

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
- 01 Physical Isotope Separation
- 02 Radiation Sources
- 03 Isotopic Power Supplies

08 HYDROGEN
- 01 Production
- 02 Storage
- 03 Transport
- 04 Marketing and Economics
- 05 Safety
- 06 Industrial and Commercial Use
- 07 By-Products
- 08 Properties
- 09 Environmental Aspects

09 OTHER SYNTHETIC AND NATURAL FUELS
- 01 Hydrocarbon Fuels
- 02 Alcohol Fuels
- 03 Inorganic Hydrogen Compound Fuels
- 04 Solid Waste Fuels
- 05 Liquid Waste Fuels
- 06 Gaseous Waste Fuels

13 HYDRO ENERGY
- 01 Resources and Availability
- 02 Site Geology and Meteorology
- 03 Plant Design and Operation
- 04 Regulations and Licensing
- 05 Economics and Management
- 06 Environmental Aspects
- 07 Power Conversion Systems

14 SOLAR ENERGY
- 01 Resources and Availability
- 03 Economics
- 04 Environmental, Legal, and Institutional Aspects
- 05 Solar Energy Conversion
- 06 Photovoltaic Power Plants
- 07 Solar Thermal Power Plants
- 08 Ocean Thermal Gradient Power Plants
- 09 Solar Radiation Utilization
- 10 Solar Collectors and Concentrators
- 20 Heat Storage

15 GEOTHERMAL ENERGY
- 01 Resource Status and Assessment
- 02 Geology, Hydrology, and Geothermal Systems
- 03 Geothermal Exploration and Exploration Technology
- 04 Legal and Institutional Aspects

15 GEOTHERMAL ENERGY (CONT.)
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 07 By-Products
- 08 Geothermal Power Plants
- 09 Geothermal Engineering
- 10 Direct Energy Utilization
- 20 Geothermal Data and Theory

16 TIDAL POWER
- 03 Regulations
- 04 Economics
- 05 Environmental Aspects
- 07 Tidal Power Plants
- 08 Wave Energy Converters

17 WIND ENERGY
- 01 Availability (Climatology)
- 03 Regulations
- 04 Economics
- 05 Environmental Aspects
- 06 Wind Energy Engineering

20 ELECTRIC POWER ENGINEERING
- 01 Power Plants and Power Generation
- 02 Environmental Aspects
- 03 Power Transmission and Distribution

21 NUCLEAR POWER PLANTS
- 01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
- 03 Power Reactors, Non-Breeding, Graphite Moderated
- 04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
- 05 Power Reactors, Breeding
- 06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
- 07 Regulation and Licensing
- 08 Economics
- 09 Process Heat Reactors

22 NUCLEAR REACTOR TECHNOLOGY
- 01 Theory and Calculation
- 02 Components and Accessories
- 03 Fuel Elements
- 04 Control Systems
- 05 Environmental Aspects
- 06 Research, Test, and Experimental Reactors
- 07 Plutonium and Isotope Production Reactors
- 08 Propulsion Reactors
- 09 Reactor Safety

25 ENERGY STORAGE
- 01 Magnetic
- 02 Compressed Gas
- 03 Pumped Hydro
- 04 Capacitor Banks
- 05 Flywheels
- 06 Thermal
- 07 Liquefied Gas
- 08 Chemical
- 09 Batteries

29 ENERGY PLANNING AND POLICY
- 01 Energy Analysis and Modeling
- 02 Economics and Sociology
- 03 Environment, Health, and Safety
- 04 Natural Resources
- 05 Research, Development, Demonstration, and Commercialization
- 06 Nuclear Energy
- 07 Transport and Storage
- 08 Waste Heat Utilization
- 10 Conservation
- 20 Supply, Demand, and Forecasting
- 30 Policy, Legislation, and Regulation
- 40 Fossil Fuels
- 50 Hydrogen and Synthetic Fuels
- 60 Electric Power
- 80 Consumption and Utilization
- 90 Unconventional Sources and Power Generation

30 ENERGY CONVERSION
- 01 MHD Generators
- 02 EHD Generators
- 03 Thermoelectric Generators
- 04 Thermionic Converters
- 05 Fuel Cells
- 08 Electromechanical Converters

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
- 01 Buildings
- 02 Transportation
- 03 Industry and Agriculture
- 06 Municipalities and Community Systems
- 09 Education and Public Relations

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
- 01 Internal Combustion Engines
- 02 External Combustion Engines
- 03 Electric-Powered Systems
- 04 Hybrid Systems
- 05 Flywheel Propulsion
- 06 Vehicle Design Factors
- 07 Emission Control
- 08 Alternative Fuels

36 MATERIALS
- 01 Metals and Alloys
- 02 Ceramics, Cermets, and Refractories
- 03 Composite Materials
- 04 Polymers and Plastics
- 06 Other Materials

40 CHEMISTRY
- 01 Analytical and Separations Chemistry
- 02 Inorganic and Physical Chemistry
- 03 Organic Chemistry
- 04 Electrochemistry
- 05 Photochemistry
- 06 Radiation Chemistry
- 07 Radiochemistry and Nuclear Chemistry
- 08 Combustion Chemistry

42 ENGINEERING
- 01 General Engineering
- 02 Facilities and Equipment
- 03 Lasers
- 04 Heat Transfer and Fluid Flow
- 05 Materials Testing

42 ENGINEERING (CONT.)
- 06 Safety Engineering
- 07 Vacuum Engineering
- 08 Electronic Circuits and Devices
- 09 Waste Processing Plants and Equipment
- 10 Combustion Systems
- 20 Underground Engineering
- 30 Marine Engineering
- 40 Pollution Control Equipment
- 50 Power Cycles

43 PARTICLE ACCELERATORS
- 01 Design, Development, and Operation
- 02 Beam Dynamics, Field Calculations, and Ion Optics
- 03 Auxiliaries and Components
- 04 Storage Rings

44 INSTRUMENTATION
- 01 Radiation Instrumentation
- 02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
- 03 Miscellaneous Instruments
- 04 Well Logging Instrumentation

45 EXPLOSIONS AND EXPLOSIVES
- 01 Chemical
- 02 Nuclear
- 03 Explosion Detection

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

52 ENVIRONMENTAL SCIENCES, AQUATIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

53 ENVIRONMENTAL–SOCIAL ASPECTS OF ENERGY TECHNOLOGIES
- 01 Social and Economic Studies
- 02 Assessment of Energy Technologies
- 03 Environmental Impact Statements

55 BIOMEDICAL SCIENCES, BASIC STUDIES
01 Behavioral Biology
02 Biochemistry
03 Cytology
04 Genetics
05 Metabolism
06 Medicine
07 Microbiology
08 Morphology
09 Pathology
10 Physiological Systems
20 Public Health
30 Agriculture and Food Technology

56 BIOMEDICAL SCIENCES, APPLIED STUDIES
01 Radiation Effects
02 Thermal Effects
03 Chemicals Metabolism and Toxicity
04 Other Environmental Pollutant Effects

57 HEALTH AND SAFETY

58 GEOSCIENCES
01 Geology and Hydrology
02 Geophysics
03 Mineralogy, Petrology, and Rock Mechanics
04 Geochemistry
05 Oceanography

64 PHYSICS RESEARCH
01 Astrophysics and Cosmology
02 Atmospheric Physics
03 Atomic, Molecular, and Chemical Physics
04 Fluid Physics
50 High Energy Physics

65 PHYSICS RESEARCH (CONT.)
10 Nuclear Physics
40 Radiation and Shielding Physics
50 Medical Physics
60 Solid State Physics
70 Theoretical Physics
80 Mathematical Physics

65 PHYSICS RESEARCH (CONT.)
90 Communication, Education, History, and Philosophy

70 FUSION ENERGY
01 Plasma Research
02 Fusion Power Plant Technology

99 GENERAL AND MISCELLANEOUS
01 Management
02 Mathematics and Computers
03 Information Handling
04 Law
05 Civilian Defense

CORPORATE INDEX

AUTHOR INDEX

SUBJECT INDEX

CONTRACT NUMBER INDEX

REPORT NUMBER INDEX

SUBJECT CONTENTS (ALPHABETICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
- 08 Alternative Fuels
- 03 Electric-Powered Systems
- 07 Emission Control
- 02 External Combustion Engines
- 05 Flywheel Propulsion
- 04 Hybrid Systems
- 01 Internal Combustion Engines
- 06 Vehicle Design Factors

56 BIOMEDICAL SCIENCES, APPLIED STUDIES
- 03 Chemicals Metabolism and Toxicity
- 04 Other Environmental Pollutant Effects
- 01 Radiation Effects
- 02 Thermal Effects

55 BIOMEDICAL SCIENCES, BASIC STUDIES
- 30 Agriculture and Food Technology
- 01 Behavioral Biology
- 02 Biochemistry
- 03 Cytology
- 04 Genetics
- 06 Medicine
- 05 Metabolism
- 07 Microbiology
- 08 Morphology
- 09 Pathology
- 10 Physiological Systems
- 20 Public Health

40 CHEMISTRY
- 01 Analytical and Separations Chemistry
- 08 Combustion Chemistry
- 04 Electrochemistry
- 02 Inorganic and Physical Chemistry
- 03 Organic Chemistry
- 05 Photochemistry
- 06 Radiation Chemistry
- 07 Radiochemistry and Nuclear Chemistry

01 COAL AND COAL PRODUCTS
- 05 By-Products
- 40 Combustion
- 09 Environmental Aspects
- 60 Health and Safety
- 50 Marketing and Economics
- 20 Mining
- 04 Processing
- 06 Properties
- 70 Regulations
- 10 Reserves and Exploration
- 30 Transport and Handling
- 08 Waste Management

20 ELECTRIC POWER ENGINEERING
- 02 Environmental Aspects
- 01 Power Plants and Power Generation
- 03 Power Transmission and Distribution

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
- 01 Buildings
- 09 Education and Public Relations
- 03 Industry and Agriculture
- 06 Municipalities and Community Systems
- 02 Transportation

30 ENERGY CONVERSION
- 02 EHD Generators
- 08 Electromechanical Converters
- 05 Fuel Cells
- 01 MHD Generators
- 04 Thermionic Converters
- 03 Thermoelectric Generators

29 ENERGY PLANNING AND POLICY
- 10 Conservation
- 80 Consumption and Utilization
- 02 Economics and Sociology
- 60 Electric Power
- 01 Energy Analysis and Modeling
- 03 Environment, Health, and Safety
- 40 Fossil Fuels
- 50 Hydrogen and Synthetic Fuels
- 04 Natural Resources
- 06 Nuclear Energy
- 30 Policy, Legislation, and Regulation
- 05 Research, Development, Demonstration, and Commercialization
- 20 Supply, Demand, and Forecasting
- 07 Transport and Storage
- 90 Unconventional Sources and Power Generation
- 08 Waste Heat Utilization

25 ENERGY STORAGE
- 09 Batteries
- 04 Capacitor Banks
- 08 Chemical
- 02 Compressed Gas
- 05 Flywheels
- 07 Liquefied Gas
- 01 Magnetic
- 03 Pumped Hydro
- 06 Thermal

42 ENGINEERING
- 10 Combustion Systems
- 08 Electronic Circuits and Devices
- 02 Facilities and Equipment
- 01 General Engineering
- 04 Heat Transfer and Fluid Flow
- 03 Lasers
- 30 Marine Engineering
- 05 Materials Testing
- 40 Pollution Control Equipment
- 50 Power Cycles
- 06 Safety Engineering
- 20 Underground Engineering
- 07 Vacuum Engineering
- 09 Waste Processing Plants and Equipment

52 ENVIRONMENTAL SCIENCES, AQUATIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

53 ENVIRONMENTAL–SOCIAL ASPECTS OF ENERGY TECHNOLOGIES
- 02 Assessment of Energy Technologies
- 03 Environmental Impact Statements
- 01 Social and Economic Studies

45 EXPLOSIONS AND EXPLOSIVES
- 01 Chemical
- 03 Explosion Detection
- 02 Nuclear

70 FUSION ENERGY
- 02 Fusion Power Plant Technology
- 01 Plasma Research

06 FUSION FUELS
- 03 By-Products
- 09 Environmental Aspects
- 05 Health and Safety
- 02 Processing
- 08 Properties
- 06 Regulations and Policy
- 01 Sources
- 04 Transport and Storage
- 07 Waste Management

99 GENERAL AND MISCELLANEOUS
- 05 Civilian Defense
- 03 Information Handling
- 04 Law
- 01 Management
- 02 Mathematics and Computers

58 GEOSCIENCES
- 04 Geochemistry
- 01 Geology and Hydrology
- 02 Geophysics
- 03 Mineralogy, Petrology, and Rock Mechanics
- 05 Oceanography

15 GEOTHERMAL ENERGY
- 07 By-Products
- 10 Direct Energy Utilization
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 02 Geology, Hydrology, and Geothermal Systems
- 20 Geothermal Data and Theory
- 09 Geothermal Engineering
- 03 Geothermal Exploration and Exploration Technology
- 08 Geothermal Power Plants
- 04 Legal and Institutional Aspects
- 01 Resource Status and Assessment

57 HEALTH AND SAFETY

13 HYDRO ENERGY
- 05 Economics and Management
- 06 Environmental Aspects
- 03 Plant Design and Operation
- 07 Power Conversion Systems
- 04 Regulations and Licensing
- 01 Resources and Availability
- 02 Site Geology and Meteorology

08 HYDROGEN
- 07 By-Products
- 09 Environmental Aspects
- 06 Industrial and Commercial Use
- 04 Marketing and Economics
- 01 Production
- 08 Properties
- 05 Safety
- 02 Storage
- 03 Transport

44 INSTRUMENTATION
- 03 Miscellaneous Instruments
- 02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
- 01 Radiation Instrumentation
- 04 Well Logging Instrumentation

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
- 03 Isotopic Power Supplies
- 01 Physical Isotope Separation
- 02 Radiation Sources

36 MATERIALS
- 02 Ceramics, Cermets, and Refractories
- 03 Composite Materials
- 01 Metals and Alloys
- 06 Other Materials
- 04 Polymers and Plastics

03 NATURAL GAS
- 09 Artificial Stimulation, Plowshare, etc.
- 40 Combustion
- 03 Drilling, Production, and Processing
- 08 Environmental Effects
- 02 Geology and Exploration
- 05 Health and Safety
- 06 Marketing and Economics
- 10 Policy, Legislation, and Regulation
- 04 Products and By-Products
- 30 Properties
- 01 Reserves
- 50 Storage
- 20 Transport, Pipelines, and Handling
- 07 Waste Management

05 NUCLEAR FUELS
- 06 By-Products
- 05 Enrichment
- 30 Environmental Aspects
- 02 Exploration
- 04 Feed Processing
- 07 Fuels Production and Properties
- 40 Health and Safety
- 10 Marketing and Economics
- 03 Mining
- 50 Regulations
- 01 Reserves
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 20 Waste Management

21 NUCLEAR POWER PLANTS
- 08 Economics
- 06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
- 05 Power Reactors, Breeding
- 03 Power Reactors, Non-Breeding, Graphite Moderated
- 01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
- 04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
- 09 Process Heat Reactors
- 07 Regulation and Licensing

22 NUCLEAR REACTOR TECHNOLOGY
- 02 Components and Accessories
- 04 Control Systems
- 05 Environmental Aspects
- 03 Fuel Elements
- 07 Plutonium and Isotope Production Reactors
- 08 Propulsion Reactors
- 09 Reactor Safety
- 06 Research, Test, and Experimental Reactors
- 01 Theory and Calculation

04 OIL SHALES AND TAR SANDS
- 06 Direct Uses and By-Products
- 03 Drilling, Fracturing, and Mining
- 10 Environmental Aspects
- 07 Health and Safety
- 08 Marketing and Economics
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 20 Regulations
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 09 Waste Research and Management

09 OTHER SYNTHETIC AND NATURAL FUELS
02 Alcohol Fuels
06 Gaseous Waste Fuels
01 Hydrocarbon Fuels
03 Inorganic Hydrogen Compound Fuels
05 Liquid Waste Fuels
04 Solid Waste Fuels

43 PARTICLE ACCELERATORS
03 Auxiliaries and Components
02 Beam Dynamics, Field Calculations, and Ion Optics
01 Design, Development, and Operation
04 Storage Rings

02 PETROLEUM
50 Combustion
03 Drilling and Production
09 Environmental Aspects
02 Geology and Exploration
06 Health and Safety
07 Marketing and Economics
10 Policy, Legislation, and Regulation
04 Processing
05 Products and By-Products
30 Properties
01 Reserves
40 Storage
20 Transport, Pipelines, and Handling
08 Waste Management

64 PHYSICS RESEARCH
01 Astrophysics and Cosmology
02 Atmospheric Physics
03 Atomic, Molecular, and Chemical Physics
04 Fluid Physics
50 High Energy Physics

65 PHYSICS RESEARCH (CONT.)
90 Communication, Education, History, and Philosophy
80 Mathematical Physics
50 Medical Physics
10 Nuclear Physics
40 Radiation and Shielding Physics
60 Solid State Physics
70 Theoretical Physics

14 SOLAR ENERGY
03 Economics
04 Environmental, Legal, and Institutional Aspects
20 Heat Storage
08 Ocean Thermal Gradient Power Plants
06 Photovoltaic Power Plants
01 Resources and Availability
10 Solar Collectors and Concentrators
05 Solar Energy Conversion
09 Solar Radiation Utilization
07 Solar Thermal Power Plants

16 TIDAL POWER
04 Economics
05 Environmental Aspects
03 Regulations
07 Tidal Power Plants
08 Wave Energy Converters

17 WIND ENERGY
01 Availability (Climatology)
04 Economics
05 Environmental Aspects
03 Regulations
06 Wind Energy Engineering

CORPORATE INDEX

AUTHOR INDEX

SUBJECT INDEX

CONTRACT NUMBER INDEX

REPORT NUMBER INDEX

ENERGY RESEARCH ABSTRACTS

01 COAL AND COAL PRODUCTS

0104 Processing

REFER ALSO TO CITATION(S) 24903, 24903, 24904, 24921, 24923, 24924, 24936, 24938, 24939, 24940, 24941, 24954, 24970, 24970, 25069, 25339, 25654, 25665, 25968, 25972, 25987

24841 (CONF-801104—16) Continuous two-stage solar-gasification system. Mathur, V.K.; Lakshmanan, S.; Manasse, F.K.; Venkataramanan, V.; Breault, R.W. (New Hampshire Univ., Durham (USA). Dept. of Chemical Engineering). 1980. Contract AC02-79ET21067. 20p. NTIS, PC A02/MF A01. Order Number DE81025019.

From 73. annual meeting of the American Institute of Chemical Engineers; Chicago, IL, USA (12 Nov 1980).

The use of solar thermal energy has the potential to play an important role in the production of fuels and chemicals. A continuous two stage fluidized bed hybrid solar coal gasification system designed at the University of New Hampshire to produce synthesis gas from various feed stocks - coal, lignite and peat is discussed. Heat and material balances are presented. The experimental data obtained from this bench scale unit will be useful for the commercialization of this technology. Economics of commercial solar gasification plants with reference to their size are discussed. A suitable capacity for a solar hybrid plant is estimated to be 1.43 x 10^6 m^3 (50 MM SCF) per day of SNG.

24842 (DOE/ET/10669—T7) Lock hopper valves for coal gasification. Final report. (Consolidated Controls Corp., El Segundo, CA (USA)). May 1981. Contract AC01-76ET10669. 91p. NTIS, PC A05/MF A01. Order Number DE81021739.

The design, fabrication, and testing of two configurations of Lock Hopper Valves is described. These two configurations are intended to meet the requirements for four typical types of service in coal gasification plants. Operating pressures for either configuration is 1600 psi. One configuration is designed for use at temperatures up to 2000°F, and the other for temperatures up to 850°F. Several unique construction features are employed, including the extensive use of dense alumina ceramic, especially in the high-temperature valve. The description includes details of construction, and problems encountered during fabrication and testing, and proposed solutions to those problems.

24843 (DOE/ET/13060—T3(Vol.2)) Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 2, overall plant. (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Corp., Livingston, NJ (USA)). May 1981. Contract AC01-77ET13060. 79p. (FE—2542-38(Vol.2)). NTIS, PC A05/MF A01. Order Number DE81025191.

Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coals into clean pipeline quality gas. The project is currently in the design phase (Phase I). This Phase is scheduled to be completed in June 1981. One of the major efforts of Phase I is the completion of process design and the project engineering design of the Demonstration Plant. This design effort has been completed. A report of the design effort is being issued in 24 volumes. This is Volume 2 which reports summary data on the overall plant. The Demonstration Plant is designed to produce 19 million standard cubic feet per day of pipeline quality gas from 1257 tons per day of Ohio No. 9 coal. By-products produced include sulfur, ammonia, oil, naphtha, and crude phenols. The gasifier requies 126 tons per day of limestone flux and 545 tons per day of oxygen. Approximately 438 gallons per minute of raw water is utilized by the Demonstration Plant. Approximately 402 tons per day of solid waste, including slag from the gasifier, will be disposed in landfills on the plant site.

24844 (DOE/ET/13060—T3(Vol.6)) Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol. (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Energy Corp., Livingston, NJ (USA)). 1981. Contract AC01-77ET13060. 40p. (FE—2542-38(Vol.6)). NTIS, PC A03/MF A01. Order Number DE81025179.

Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coals into clean pipeline quality gas. The project is currently in the design phase which is scheduled to be completed in June 1981. One of the major efforts of Phase I is the completion of the process design and the project engineering design of the Demonstration Plant. A report of the design effort is being issued in 24 volumes. Volume 6 reports the design of Plant Section 400 - Rectisol. The Rectisol Unit removes acid gases (H_2S, CO_2), naphtha, and other miscellaneous sulfur compounds from the cooled synthesis gas. The sulfur compounds must be removed from the synthesis gas because these compounds would deactivate the methanation catalyst in Plant Section 500. The removal of the acid gases and naphtha from the crude synthesis gas is accomplished by physical absorption in cold, circulating methanol. The impure methanol is hot regenerated to produce a single off-gas which is transferred to Plant Section 900 for sulfur recovery. The desulfurized synthesis gas is transferred to Plant Section 500 for shift and methanation. The Rectisol Process yields a purified synthesis gas which contains less than 0.2 parts per million of sulfur compounds. The design quantities of feed gas to Plant Section 400 and the major output streams from this section are as follows: crude synthesis gas feed - 64 million SCFD, purified synthesis gas - 60 million SCFD, acid gas stream - 2.9 million SCFD, and naphtha-22.2 tons per day.

24845 (DOE/ET/13060—T3(Vol.7)) Demonstration plant engineering and design. Phase I: the pipeline gas demonstration plant. Volume 7. Plant Section 500 - shift/methanation. (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Energy Corp., Livingston, NJ (USA)). 1981. Contract AC01-77ET13060. 34p. (FE—2542-38(Vol.7)). NTIS, PC A03/MF A01. Order Number DE81025190.

Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coals into clean pipeline quality gas. The project is currently in the design phase (Phase I). This phase is scheduled to be completed in June 1981. One of the major efforts of Phase I is the completion of the process design and the project engineering design of the Demonstration Plant. A report of the design effort is being issued in 24 volumes. This is Volume 7 which reports the design of Plant Section 500 - Shift/Methanation. The shift/methanation process is used to convert the purified synthesis gas from the Rectisol unit (Plant Section 400) into the desired high-Btu SNG product. This is accomplished in a series of fixed-bed adiabatic reactors. Water is added to the feed gas to the reactors to effect the requisite reactions. A nickel catalyst is used in the shift/methanation process, and the only reaction products are methane and carbon dioxide. The carbon dioxide is removed from the SNG in Plant Sectin 600 - CO_2 Removal. After carbon dioxide removal from the SNG, the SNG is returned to Plant Section 500 for final methanation. The product from the final methanation reactor is an SNG stream having a gross heating value of approximately 960 Btu

per standard cubic foot. The shift/methanation unit at design conditions produces 19 Million SCFD of SNG from 60 Million SCFD of purified synthesis gas.

24846 **(DOE/ET/13060—T3(Vol.12)) Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation.** (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Energy Corp., Livingston, NJ (USA)). 1981. Contract AC01-77ET13060. 39p. (FE—2542-38(Vol.12)). NTIS, PC A03/MF A01. Order Number DE81025183.

Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coals into clean pipeline quality gas. The project is currently in the design phase (Phase I). This phase is scheduled to be completed in June 1981. One of the major efforts of Phase I is the process and project engineering design of the Demonstration Plant. The design has been completed and is being reported in 24 volumes. This is Volume 12 which covers the design of Plant Section 1100 - Gas Liquor Separation. The purpose of the Gas Liquor Separation unit is to separate the tar and oil from the gas liquor streams from Plant Sections 300 and 400. The gas liquor streams consist mainly of water with varying amounts of dust, tar, oil, phenol, fatty acids, and dissolved gases such as ammonia, carbon dioxide, and hydrogen sulfide. Tar, oil, carbon dioxide, hydrogen sulfide, and dust are recovered in the Gas Liquor Separation unit producing a gas liquor with primarily ammonia and phenols to be removed in downstream units. The tar product is reinjected into the gasifier. The Gas Liquor Separation unit is designed to produce 2696 pounds per hour of oil product.

24847 **(DOE/ET/13060—T3(Vol.13)) Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 13. Plant Section 1200, Phenol Extraction.** (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Corp., Livingston, NJ (USA)). May 1981. Contract AC01-77ET13060. 33p. (FE—2542-38(Vol.13)). NTIS, PC A03/MF A01. Order Number DE81025391.

Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coals into clean pipeline quality gas. The project is currently in the design phase (Phase I). This phase is scheduled to be completed in June 1981. One of the major efforts of Phase I is the process and project engineering design of the Demonstration Plant. The design has been completed and is being reported in 24 volumes. This is Volume 13 which covers the design of Plant Section 1200 - Phenol Extraction. The Phenol Extraction unit employs the Phenosolvan Process to remove phenolic materials from the gas liquor from the Gas Liquor Separation Section. Phenols are recovered by solvent extraction using isopropyl ether in a series of mixer-settler tanks. The solvent-phenol mixture is separated by distillation. The solvent is recycled to the extractors, and the crude phenols are transferred to storage. The Phenol Extraction unit is designed to produce 360 pounds per hour of crude phenol product.

24848 **(DOE/ET/13060—T4) Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant.** DiFulgentiz, R.A. (Conoco, Inc., Stamford, CT (USA)). 1981. Contract AC01-77ET13060. 39p. (FE—2542-37). NTIS, PC A03/MF A01. Order Number DE81024967.

Contract No. EF-77-C-01-2542 between the United States Department of Energy and Conoco Inc. provides for the design, construction, and operation of a demonstration plant capable of converting high-sulfur bituminous caking coal into clean pipeline quality gas. One of the assignments under the contract is to formulate plans for the sale, use, or disposition of all products and by-products that will be produced in the Demonstration Plant during construction and operations. The products and by-products include pipeline quality gas (SNG), ammonia, sulfur, crude phenols, tar, oil, naphtha, slag, and run-of-mine Ohio No. 9 coal uncovered during site preparation work. The SNG will be sold to a gas transmission company. The ammonia, sulfur and naphtha will be sold to companies that use or market these substances. The tar, oil, and crude phenols will be consumed in the Demonstration Plant or marketed to a third party for upgrading. The slag will be buried in a landfill area on the plant site. The run-of-mine Ohio No. 9 coal uncovered during site preparation work will be sold to a coal company in the Noble County area.

24849 **(DOE/ET/14700—5) Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980.** Wiser, W.H. (Utah Univ., Salt Lake City (USA). Dept. of Mining and Fuels Engineering). May 1981. Contract AC22-79ET14700. 44p. NTIS, PC A03/MF A01. Order Number DE81023260.

The highlights to date are: new measurements of diffusion of polyaromatic compounds in alumina catalyst supports using improved experimental and data analysis techniques have shown that surface diffusion is not operative in these systems as has been previously thought; and the new results show evidence of a restrictive drag effect, lowering effective diffusivities for the larger molecules under study. Reports of the following task groups with detailed conclusions are presented: Carbon-13 NMR Investigation of Coal Derived Liquids (CDL) and Coal; Catalysis and Mechanism of Coal Liquefaction; The Fundamental Chemistry and Mechanism of Pyrolysis of Bituminous Coal; Catalytic Hydrogenation of CDL and Related Polycyclic Aromatic Hydrocarbons; Denitrogenation and Deoxygenation of CDL and Related N- and O- Compounds; Catalytic Cracking of Hydrogenated CDL and Related Hydrogenated Compounds; Systematic Structural-Activity Study of Supported Sulfide Catalysts for Coal Liquids Upgrading; Diffusion of Polyaromatic Compounds in Amorphous Catalyst Supports; Catalyst Research and Development; and Characterization of Catalysts and Mechanistic Studies.

24850 **(DOE/ET/14752—T5) Advanced coal-gasification system for electric-power generation. Fourth quarterly progress report, July 1-September 30, 1980.** (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 1980. Contract AC21-80ET14752. 128p. NTIS, PC A07/MF A01.

Tests TP-027-3,4 and 5 in the advanced fluidized bed gasification process development unit were single stage, oxygen-blown tests. The results are described. An increase in pressure from 130 psig to 230 psig had a relatively small effect on gasifier kinetics. Work on the cold flow test facility, scale-up and component engineering, devolatilization and burnup tests, coal fines recycle and screening tests on the environmental effects of ash agglomerates are reported. (LTN)

24851 **(DOE/ET/14809—6) Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981.** Bartholomew, C.H. (Brigham Young Univ., Provo, UT (USA)). 20 Apr 1981. Contract AC01-79ET14809. 30p. NTIS, PC A03/MF A01. Order Number DE81023949.

During the sixth quarter, a 15 weight % boride-promoted, silica-supported iron catalyst was prepared. Preparations of unsupported cobalt and iron borides were in progress. Characterization of supported iron catalysts by O_2 titration and H_2 and CO chemisorption showed dispersions to range from 1.6% to 9.3% and percent reductions to range from 12 to 80%. Reduction was essentially optimum after 36 hours in flowing H_2 at 725 K. CO_2 chemisorption on potassium-promoted and unpromoted iron catalysts showed surface concentration of the potassium to be markedly greater than bulk concentration. Activity/selectivity measurements were performed on four iron/silica catalysts and one iron boride/silica catalyst. The iron boride/SiO_2 catalyst was found to be relatively inactive in comparison to the iron/silica catalysts. Increasing H_2/CO ratio shifted selectivity of iron/silica to lower molecular weight products; the addition of potassium greatly enhanced production of higher molecular weight hydrocarbons at the expense of CH_4 production. Alcohols and CO_2 were also detected as products of the reaction.

24852 (DOE/ET/21067—2) Alternate fuels manufactured from high temperature solar thermal systems. Technical annual progress report, April 1, 1980-March 31, 1981. (New Hampshire Univ., Durham (USA)). 1981. Contract AC02-79ET21067. 15p. NTIS, PC A02/MF A01. Order Number DE81024112.

A feasibility study of three modes of transportation of coal and lignite is discussed. These modes are railroads, barges and slurry pipe lines. Geographical aspects and estimated costs of transporting coal are briefly considered. The size and capacity of solar gasification plants are discussed, and locations are considered. Economic feasibility assessments for hybrid and direct solar units with respect to export potential are discussed. A bench scale fluidized-bed coal gasification unit is described, and its heat and material balances are tabulated. (LEW)

24853 (DOE/FC/10121—T1) Conversion of solvent refined lignite into premium liquid fuels. Quarterly report, January-March 1981. Baltisberger, R.J.; Stenberg, V.I.; Klabunde, K.J.; Woolsey, N.F. (North Dakota Univ., Grand Forks (USA)). Apr 1981. Contract AT18-78FC10121. 19p. NTIS, PC A02/MF A01. Order Number DE81024402.

Three samples of lignite derived coal liquids were fractionated into preasphaltenes, asphaltenes and heavy oils by liquid extraction. They were then acetylated and examined by gas chromatography, analyzed for molecular weight, acid and elemental content; proton nmr analyses were carried out to determine the aromatic nature. The results are described in detail. In another task the mechanism of cleavage of hydrocarbon linkages was studied using model compounds. Four new heterogeneous catalysts were evaluated using hydrogen and a mixture of carbon monoxide and water. (LTN)

24854 (DOE/MC—159) W-K-M Dyna-Seal Ball Valve METC SOA Test Valve No. A-7, state-of-the-art lockhopper valve-testing and development project. Summary test report. Gardner, J.F.; Hall, R.C.; Hornbeck, R.G.; Griffith, R.A.; Yost, T.M.; Harvey, D.M.; Gayheart, T.R.; Maxfield, D.A. (TRW, Inc., Cleveland, OH (USA)). Dec 1980. Contract AM21-80MC14522. 34p. NTIS, PC A03/MF A01. Order Number DE81023371.

The 6-inch, W-K-M, Model 310, Full-Port, DynaSeal Ball Valve with chromium-oxide coated ball and seats (METC SOA Test Valve No. A-7) completed 465 cycles with clean gas in the Valve Static Test Unit and 3,258 cycles with limestone solids in the Valve Dyname Test Unit. Inspection of the valve after static testing revealed chipping of the chromium oxide coating in noncritical areas around the stem slot and ball lips. In dynamic testing the valve exhibited excessive leakage with the 1/4-inch x 100-mesh limestone test medium. The minus 100-mesh limestone test medium accumulated between the ball and valve body, which led to increased friction. The actuator exerted increasingly higher torques on the valve stem and eventually deformed the valve stem. Several modifications would be necessary to overcome the problems Test Valve No. A-7 experienced in dynamic testing. The chromium-oxide coating showed relatively little wear indicating that this type of trim is suitable for solids-handling lockhopper service. A similar W-K-M, Model 310 Ball Valve was rebuilt by METC using ceramic aluminum-oxide ball and seats. The initial leakage was high due to surface irregularities remaining from the manufacturing process. After relatively few cycles in a clean gas, extensive chipping of the ball was discovered. It was concluded that the use of solid ceramic components requires a valve design that accommodates their specific physical properties.

24855 (DOE/MC—169) Anchor/Darling Double-Disc Gate Valve, METC SOA Test Valve No. A-12 and Test Valve No. A-12R state-of-the-art Lockhopper Valve-Testing and Development Project. Summary test report. Gardner, J.F.; Galvin, W.E.; Gayheart, T.R.; Griffith, R.A.; Hall, R.C.; Hornbeck, R.G.; Maxfield, D.A.; Nieman, H.D.; Chester, S.O. (TRW Energy Systems Planning Div., Morgantown, WV (USA)). Mar 1981. Contract AM21-80MC14522. 41p. NTIS, PC A03/MF A01. Order Number DE81025186.

The Anchor/Darling Double-Disc Gate Valve (METC SOA Test Valve Nos. A-12 and A-12R) performed well in testing with clean gases. The packing developed some leakage, but it could be controlled by tightening the packing gland. In both dynamic and slurry testing, solids accumulated in the bonnet and internals, jamming the valve. The forces on internal parts as a result of the jamming were sufficient to crack the hardfacing on the seats and discs. Any design with voids that can be packed with particles will have difficulty handling solids media. It is recommended that no further testing be performed on this valve.

24856 (DOE/MC/17783—T1) Uncovering and evaluation of a twenty-five-year-old underground-coal-gasification burn at a site in Gorgas, Alabama. Capp, J.P. (Capp (John P.), Morgantown, WV (USA)). Apr 1981. Contract AP21-81MC17783. 34p. NTIS, PC A03/MF A01.

During the late forties and into the fifties, the US Bureau of Mines (USBM) and the Alabama Power Company conducted a series of underground coal gasification burns in the Pratt and America coal beds at Gorgas, Alabama. Following the first burn, by the so called stream method, it was feasible to enter the burned out areas by deep mining and assess what had taken place during the operation of the test site. In the latter tests, however, it was not economically feasible to explore the burned out areas except by means of core drilling. Now, in early 1981, surface mining is being done in the vicinity of the first hydraulic fracture area. I had been there during the active operation of the burns and agreed to go to Gorgas, evaluate the exposed area, collect samples, take photographs, and provide this written report. I spent several days taking photographs and making observations at the exposed burn site, taking samples, and discussing the best ways to coordinate future exposures with the coal mining process. The uncovered burn area at the site of the first hydraulic fracture can be described as a flat, roughly circular shaped area, varying in thickness from about 1 foot to 2 feet high and covered with a mixture of the various materials removed in the mining operation, i.e., broken bits of coal, rock, clay, etc. However it rained the night before the observation and during the entire evaluation period making it extremely difficult to determine whether fine gray colored materials were clay or residual ash.

24857 (DOE/OR/03054—T5) Kentucky Department for Natural Resources and Environmental Protection: permit application for air contaminant source. Supplement II. (International Coal Refining Co., Allentown, PA (USA)). 24 Apr 1981. Contract AC05-78OR03054. 248p. NTIS, PC A11/MF A01.

This document constitutes a supplement to an application for a Kentucky permit to construct an air contaminant source as well as a prevention of Significant Deterioration permit. It contains responses to 49 comments and questions from the Kentucky Department for Natural Resources pertaining to the SRC-I Demonstration Plant in Newman, Kentucky.

24858 (DOE/PC/30080—T3) Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly progress report, September-November 1980. Cronauer, D.C.; Ruberto, R.G.; McNeil, R.I.; Young, D.C. (Gulf Research and Development Co., Pittsburgh, PA (USA)). Feb 1980. Contract AC22-80PC30080. 74p. NTIS, PC A04/MF A01. Order Number DE81025131.

Hydrogen transfer experiments using Powhatan No. 5 bituminous coal (Pittsburgh Seam) and labeled solvents are continuing. Experimentation with d_4- and d_{12}-tetralin is essentially complete with only a limited number of product analyses remaining. The liquefaction runs with d_4-tetralin were made at temperatures of 300, 350, 400 and 450°C and at run times of 0, 10 and 30 min; additional runs were made with d_{12}-tetralin at 400 and 450°C. Samples of the various product fractions, such as asphaltenes, were examined by ^{2}H-NMR to observe the site of deuterium transfer. In essentially all cases, the relative distribution of deuterium was primarily influenced by reaction temperature and not run time in spite of a major change in the absolute amount of hydrogen transfer with run time. Furthermore, much of the coal liquefaction process for bituminous coals occurs during the reactor heat-up time even though a low level of hydrogen transfer occurs. Therefore, the subsequent hydrogen (deuterium) distribution is strongly influenced by up-grading type reactions that occur after the heat-up time (2.3 min). We are

undertaking a limited number of hydrogen/deuterium scrambling reactions to understand the background reactions. Experimentation has been completed to show that the best instrumental approach to measure hydrogen donor capacity available to us is that of Seshadri et al. reported in Fuel (1978 and 1979). Results concerning the isolation of solvent fractions prior to ^{13}C-NMR determination of hydroaromatics are discussed. Plans have been established to carry out SRC-II type recycle runs with ^{13}C labeled solvents.

24859 (DOE/PC/30264—06) Controlled flash pyrolysis. Durai-Swamy, K.; Che, S.C.; Chen, C.B.; Jain, R.; Kim, S.S.; Von Schonfeldt, H. (Occidental Research Corp., Irvine, CA (USA)). Apr 1981. Contract AC22-80PC30264. 31p. NTIS, PC A03/MF A01. Order Number DE81024384.

Six baseline tests were made in the Controlled Flash Pyrolysis unit with a coal feed rate of about 2 kg/h. Preliminary material balance and yield data for these tests are presented in this report. A laboratory scale (1 gm/min.) reactor has been set up to get once-through pyrolysis data. Free radical studies on coal pyrolysis have begun using an Electron Spin Resonance spectrometer.

24860 (EPRI-AP—1803) Coal-devolatilization information for reactor modeling: assessment of data and apparatus availability with recommendations for research. Final report. Howard, J.B.; Peters, W.A.; Serio, M.A. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). 1981. 307p. NTIS, PC A14/MF A01.

This study on coal devolatilization: (1) surveys known experimental research for information needed in modeling coal gasifiers, (2) identifies the capabilities of existing experimental apparatus, and (3) formulates a research program to fill the infomation gaps found in the above survey. The characteristics of three gasifiers, British Gas/Lurgi, Texaco, and Combustion Engineering are emphasized; a conceptual description of devolatilization phenomena occurring in each gasifier is provided as a basis for the literature and apparatus surveys. Devolatilization and related phenomena govern the yield of tar and the heating value of the product gas from the British Gas/Lurgi gasifier, and apparently limit the range of soot- and tar-free operating conditions for the Texaco and Combustion Engineering gasifiers. The existing experimental data and other pertinent information on devolatilization for modeling these gasifiers were found inadequate in the areas of: primary pyrolysis, secondary reactions, and interactions of these reactions with physical mixing. Experimental equipment suitable for the necessary research on coal devolatilization is generally available in existing facilities, with required additions or modifications being relatively minor. A comprehensive research program is recommended which can apply these facilities to fill the outstanding informtion gaps.

24861 (EPRI-AP—1827) Evaluation of a short-residence-time two-stage SRC process. Final report. Tarrer, A.R.; Curtis, C.W.; Guin, J.A. (Auburn Univ., AL (USA). Dept. of Chemical Engineering). Apr 1981. 110p. NTIS, PC A06/MF A01.

The feasibility of a two stage process for the production of a low sulfur solvent-refined coal capable of meeting EPA New Point Source Emission Standards is evaluated. The feasibility of a two stage process had previously been shown for Western Kentucky No. 9/14 coal and Western Kentucky processing solvent. Indiana V coal and Indiana V process solvent are evaluated in this work. Two baselines for the first stage liquefaction system are established: one at low temperature/long time and the other at high temperature/short reaction time. To the first stage, two sulfur scavenging materials, SRC residue ash and ferric oxide, are added. In each case, the sulfur scavengers are not as effective in lowering the sulfur content of the Indiana V SRC as the scavenger was in reducing the sulfur content of Kentucky No. 9/14 SRC. The effectiveness of a sulfur scavenger, therefore, appears to be coal dependent. Second stage catalyst hydrogenation using a Co-Mo-Al catalyst in the Indiana V coal/solvent successfully lowers the sulfur content of the second stage products and was somewhat independent of sulfur content of the feed. The Indiana V coal/solvent system, therefore, requires carefully chosen process conditions to maximize sulfur removal in the two stage process. A higher molecular weight blended solvent is evaluated at low temperature/long reaction time and high temperature/short reaction time conditions. When the liquefaction reactions using the blended solvent are compared to the baseline reactions, higher coal conversions are achieved.

24862 (EPRI-NP—1824) Load-change testing of a large commercial oxygen plant. Final report. Chatterjee, N.; Sorensen, J.C.; Patrylak, A.J. (Air Products and Chemicals, Inc., Trexlertown, PA (USA)). Apr 1981. 46p. NTIS, PC A03/MF A01.

A series of transient response tests was successfully conducted by Air Products and Chemicals on one of three 1,000 T/D oxygen production plants operated under computer control at their La Porte, Texas facility. These tests involved a series of rapid rate changes in oxygen production specified to simulate the varying demand for oxygen of a coal gasifier in combined cycle power generation service. Since the ability of the oxygen plant itself to rapidly change its gaseous production rate is an important element in the design and operation of GCC (Gasification Combined Cycle) plants, a series of load following tests was arranged. The actual oxygen plant rate changes easily exceeded the targeted response rate with minimal variation in product oxygen purity. Oxygen production rate changes of +- 10 to +- 13% of design in 1 to 2 min were readily accomplished. The production rate was also varied over the full range from 70% to 105% of design at a continuous ramp rate of approximately 2% of design production per minute. During such tests, oxygen purity was maintained at close to 99.0%; the maximum variation at any time was only +- 0.2% by volume. Fundamental to the plant's ability to respond to load changes was the integration of the air separation plant design and closed loop computer control scheme which uses a direct digital control algorithm with a combined feedforward/feedback control strategy. Since the oxygen compressor is an important element in the overall oxygen plant performance, a separate series of tests was carried out specifically to demonstrate the load-following capability of an oxygen compressor. One of the 1000 T/D centrifugal compressors efficiently accommodated flowrate changes greater than +- 20% in less than three minutes. The rate changes were successfully repeated several times in rapid succession to meet or exceed the stringent requirements for a load-following oxygen plant, as specified by EPRI.

24863 (FE—2315-60) Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report for the period October-December 1980 and annual summary for 1980. Sullivan, R.F.; O'Rear, D.J. (Chevron Research Co., Richmond, CA (USA)). Jan 1981. Contract AC22-76ET10532. 12p. NTIS, PC A02/MF A01.

In this report, the pilot plant studies on the refining of two H-Coal syncrudes are summarized. This report shows that conventional transportation fuels (jet, diesel, and motor gasoline) can be refined from the H-Coal syncrudes. These syncrudes are relatively low boiling when compared to petroleum. As a consequence of this property, excellent yeilds of distillate fuels (jet and diesel) can be obtained from the syncrudes by simple hydrotreating with no subsequent cracking process. For the exclusive production of gasoline, a cracking process is needed. Hydrotreating and, when necessary, hydrocracking appear to be suitable refining routes for converting the coal-derived syncrude to transportation fuels. This route gives a yield of transportation fuel almost equivalent to the original volume of the syncrude. In addition, the heteroatoms are ultimately removed as sulfur and salable ammonia. The pilot plant studies have shown that modern commercial hydroprocessing technology can be used to refine the H-Coal syncrudes. However, they also show that high boiling impurities in the syncrudes can make these feedstocks difficult to refine in the downstream hydroprocessing units. Most of these impurities can be removed by redistilling the syncrude.

24864 (FE—2595-6) Development of new catalysts for coal liquids refining. Sixth quarterly report, 1 April 1980-30 June 1980. (Filtrol Corp., Los Angeles, CA (USA)). Jul 1980. Contract AC01-78ET12103. 29p. NTIS, PC A03/MF A01.

Exploratory cracking catalysts, formulated with 20% exchanged US-Y zeolite, and 80% matrix binder, were activity tested with a hydrotreated SRC-II Fuel Oil Blend. The best results, 55.0 wt % corrected conversion at 900°F and 64.7 wt % corrected conversion at 1000°F, and 41.3 wt % C_6-EP gasoline yields, respec-

tively, were obtained with a US-Y-Cr exchanged zeolite. Exploratory hydrotreating catalysts prepared from nickel and cobalt molybdates impregnated on TiO_2 promoted alumina were found to be not as active for HDN (62 to 82%) as either the commercial baseline catalyst Filtrol HPC-40 (88% HDN) or P_2O_5 promoted alumina nickel molybdate catalysts tested previously (81 to 85% HDN) after 24 hours on stream at 750°F; 1000 psig; 1 ml/ml-h, LHSV; and 5000 SCF/bbl., H_2 flow rate. Exploratory hydrotreating catalysts, prepared from cobalt and nickel-exchanged and substituted-SMM, with or without molybdenum, and extruded as is, or compunded with alumina were found to be not as active (maximum HDN 60 to 62%) as commercial alumina and silica-alumina supported hydrotreating catalysts.

24865 Mechanochemical hydrogenation of coal. Farber, G.; Naphtali, L.M.; Smol, R.; Yang, R.T. (to Department of Energy). US Patent 4,250,015. 10 Feb 1981. Filed date 18 Dec 1978. vp.

Hydrogenation of coal is improved through the use of a mechanical force to reduce the size of the particulate coal simultaneously with the introduction of gaseous hydrogen, or other hydrogen donor composition. Such hydrogen in the presence of elemental tin during this one-step size reduction hydrogenation further improves the yield of the liquid hydrocarbon product.

24866 (IS-M—317) Evaluation of the removal of organic sulfur from coal. Markuszewski, R.; Fan, C.W.; Greer, R.T.; Wheelock, T.D. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 22p. (CONF-801125—3). NTIS, PC A02/MF A01. Order Number DE81023789.

From 12. central regional meeting of the American Chemical Society; Pittsburgh, PA, USA (12 Nov 1980).

Organic sulfur was removed from three bituminous coals by the oxydesulfurization process developed at the Ames Laboratory. This method is based on leaching finely powdered coal with hot solutions of dilute sodium carbonate containing oxygen under moderate pressure. The organic sulfur content was then analyzed by different techniques to evaluate the removal of organic sulfur. The American Society for Testing and Materials procedure (D2492), which is an indirect method based on the difference between the total sulfur and the total inorganic sulfur, was used to determine the organic sulfur content. In addition, the fate of iron and sulfur was assessed by a series of extraction experiments with analysis of the solid residues and the liquid extracts by conventional chemical methods. Finally, an instrumental method based on electron microprobe x-ray analysis was used for the direct determination of organic sulfur in the organic matrix. Significant reduction of total sulfur was obtained by oxydesulfurization of the three coals. The removal of organic sulfur was found to be quite different, depending on the method chosen for comparison of organic sulfur levels in the raw and in the treated coals. In addition, the degree of removal of organic sulfur was subject to influences arising from the analytical methodology. Thus the difficulties in evaluating the removal of organic sulfur from coal are not only due to differences in characteristics from coal to coal, sample heterogeneity, or fluctuations in the treatment. The variations in the organic sulfur content may also stem from analytical problems which are especially likely with coals that have been altered during the chemical desulfurization treatment. This points to a need for a method of determination of organic sulfur that is direct, applicable to raw as well as chemically treated coals, and employable on a routine basis.

24867 (IS-M—318) Desulfurization of coal by oxidation in alkaline solutions. Chuang, K.C.; Markuszewski, R.; Wheelock, T.D. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 27p. (CONF-801104—15). NTIS, PC A03/MF A01. Order Number DE81023741.

From 73. annual meeting of the American Institute of Chemical Engineers; Chicago, IL, USA (12 Nov 1980).

On the basis of this work and previous studies, it has been demonstrated that high-sulfur bituminous coals can be desulfurized by leaching them with hot, dilute solutions of alkali containing dissolved oxygen under pressure. Dilute alkaline solutions have been shown to be more effective than acidic solutions by removing more sulfur under similar conditions. Among various alkalis tested, sodium carbonate or bicarbonate are among the most effective and lowest in cost. Oxydesulfurization with alkaline solutions appears to remove more inorganic than organic sulfur from coal. It has been shown that most of the sulfur can be extracted fairly rapidly from small particles of nearly pure pyrite or from pulverized coal containing sulfur which is largely in the form of pyrite. On the other hand, the removal of sulfur from physically precleaned coal containing a relatively high proportion of organic sulfur has been only partially successful. The results reported indicate that the removal of organic sulfur may depend on destroying the organic structure of the coal. Leaching experiments with various coals have shown that at moderate temperature, for example, 150°C, the total quantity of sulfur extracted in a given period of time increases with increasing oxygen partial pressure. On the other hand, the heating value recovery is not affected significantly by increasing oxygen pressure. For coal with a high proportion of pyritic sulfur, the total sulfur reduction reaches a maximum when leaching is conducted somewhere between 120 and 160°C depending on the oxygen partial pressure. However, for coal with a high proportion of organic sulfur, the total sulfur reduction increases continuously with increasing temperature. The heating value recovery is also affected by temperature.

24868 (LBL—12278) Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts. Kellner, C.S. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Jun 1981. Contract W-7405-ENG-48. 193p. NTIS, PC A09/MF A01. Order Number DE81025158.

Thesis.

A detailed study of the kinetics of the Fischer-Tropsch synthesis of hydrocarbons, methanol, and acetaldehyde, over alumina- and silica-supported ruthenium catalysts has been carried out over a broad range of reaction conditions. Based on these results and information taken from the literature, mechanisms for the formation of normal paraffins, α-olefins, methanol, and acetaldehyde have been proposed. Rate data were obtained between 448 and 548K, 1 and 10 atm, and H_2/CO ratios between 1 and 3, utilizing a micro flow reactor operated at very low conversions. In addition to the studies performed with H_2/CO mixtures, a series of experiments were carried out utilizing D_2/CO mixtures. These studies were used to help identify rate limited steps and steps that were at equilibrium. A complementary investigation, carried out by in situ infrared spectroscopy, was performed using a Fourier Transform spectrometer. The spectra obtained were used to identify the modes of CO adsorption, the CO coverage, and the relative reactivity of different forms of adsorbed CO. It was established that CO adsorbs on alumina-supported Ru in, at least, two forms: (i) Ru-CO and (ii) OC-Ru-CO. Only the first of these forms participates in CO hydrogenation. The coverage of this species is described by a simple Langmuir isotherm. A reaction mechanism is presented for interpreting the kinetics of hydrocarbon synthesis, the olefin to paraffin ratio for each product, and the probability of chain propagation. Rate expressions based on this mechanism are reasonably consistent with the experimental data. Acetaldehyde, obtained mainly over silica-supported Ru, appears to be formed by a mechanism related to that for hydroformulation of olefins. The effect of the dispersion of Ru/Al_2O_3 catalysts on their specific activity and selectivity was also investigated. The specific activity for all products decreased rapidly with increasing dispersions.

24869 (MLM-MU—81-62-0007) Pricetown I underground coal gasification field test: operations report. Agarwal, A.K.; Seabaugh, P.W.; Zielinski, R.E. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 269p. NTIS, PC A12/MF A01. Order Number DE81025162.

An Underground Coal Gasification (UCG) field test in bituminous coal was successfully completed near Pricetown, West Virginia. The primary objective of this field test was to determine the viability of the linked vertical well (LVV) technology to recover the 900 foot deep, 6 foot thick coal seam. A methane rich product gas with an average heating value of approximately 250 Btu/SCF was produced at low air injection flow rates during the reverse combustion linkage phase. Heating value of the gas produced during the linkage enhancement phase was 221 Btu/SCF with air injection. The high methane formation has been attributed to the thermal and hydrocracking of tars and oils along with hydropyrolysis and hydrogasification of coal char. The high heating value of

the gas was the combined effect of residence time, flow pattern, injection flow rate, injection pressure, and back pressure. During the gasification phase, a gas with an average heating value of 125 Btu/SCF was produced with only air injection, which resulted in an average energy production of 362 MMBtu/day.

24870 **(PB—81-111387) Evaluation of coal conversion catalysts. Annual report.** Lee, A.L. (Institute of Gas Technology, Chicago, IL (USA)). Mar 1980. Contract GRI-5014-322-0139. 16p. NTIS, PC A02/MF A01.

Three sulfur-resistant methanation catalysts were evaluated with feed mixtures simulating raw gasifier effluents for extended periods. These catalysts were evaluated at 200, 400, and 1000 psig; 500, 700, 800, 900, 1000, 1100, and 1200F; 2000, 3000, and 4800 Scf/hr- cu ft; using feeds containing sulfurs (H2S, COS, CH3SH, C2H5SH, and C4H4S) up to 3 mole percent.

24871 **(PB—81-111395) Development of catalysts for coal conversion. Annual report for 1979.** Happel, J.; Hnatow, M.A.; Bajars, L. (Catalytic, Inc., Philadelphia, PA (USA)). Jan 1980. Contract GRI-5014-322-0145. 24p. NTIS, PC A02/MF A01.

A major breakthrough was accomplished in the development of a new family of catalysts. These formulations have such high activity in the presence of high concentrations of CO2 that they can be used in a process cycle to produce syngas with only one acid gas removal step. Steam consumption will also be reduced from that required in conventional methanation processes. Eighty six new catalyst formulations and one hundred seventy three reduction and evaluation tests were conducted. A wide variety of potential catalytic material was tested. The best catalysts were futher tested at high pressures and with gas feeds simulating raw syngas from several different types of processes.

24872 **(PB—81-114290) Rapid-rate bituminous coal gasification. Annual report 1 Jan-31 Dec 79.** Tran, D.Q.; Mikkelsen, A.R. (Institute of Gas Technology, Chicago, IL (USA)). Oct 1980. Contract GRI-5011-322-0082. 27p. NTIS, PC A03/MF A01.

Cold-flow model studies were conducted in a 91.4 cm (3 ft) testing tube to elucidate phenomena that cause divergence of coal particle trajectories and to define the optimum coal injector configuration. Results of these studies showed that it is essential to wet-screen the crushed coal that for particles in the range of 74 to 250 microns, the particle trajectories were laminar at nozzle Reynolds numbers of up to 30. For these Reynolds numbers, the results showed that coal particles in the size range 44 to 105 micrometer (-40+325 mesh) can achieve smooth streamline flow patterns over a free-fall distance greater than 76.2 cm (30 in). Larger particles, up to 250 micrometer (-60 mesh), achieve even greater laminar free-fall distances exceeding 91.4 cm (36 in). These free-fall distances will permit achievement of coal particle residence times of up to 2 seconds in the laminar-flow reactor. The results of the cold-flow model study were used to design the configuration of the laminar-flow reactor and the coal injection and collection probes. The design of the laminar-flow reactor incorporates a balanced-pressure technique to reduce the time required to heat the reactor to its operating temperature. The reactor system is designed for operation at pressures up to 10.3 MPa (1500 psig) and temperatures up to 1900 deg. Major components of the reactor system were fabricated and received during 1979. The reactor system will be assembled when the high-bay laboratory area becomes available.

24873 **(SAND—81-1347C) Design and use of density gauges for fossil-energy processes.** Sample, D.G.; Thomas, M.G.; Linn, J.K. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 24p. (CONF-810607—6). NTIS, PC A02/MF A01. Order Number DE81023306.

From Symposium on instrumentation and control for fossil energy processes; San Francisco, CA, USA (8 Jun 1981).

A density gauge has been designed to function as a catalyst level detector in the H-Coal 1 in. h Bench Reactor. The system utilizes a ^{137}Cs source and a BiGe scintillator as a detector. The source/detector systems are encompassed in a yoke which can be maneuvered over ~ 1/3 of the reactor height. Both catalyst level and bed uniformity can be measured. The system, as tested, can distinguish coal slurry and roughly 5% catalyst by volume.

24874 **Evaluation of the donor ability of coal liquefaction solvents.** Bockrath, B.C.; Noceti, R.P. (Dept. of Energy, Pittsburgh, PA). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 94-104(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

A test was devised to evaluate the donor ability of coal liquefaction solvents. This test embodies the main features of the free radical mechanism of coal liquefaction. Benzyl radicals generated by the thermolysis of a convenient precursor at relatively low temperatures behave like the free radicals generated by the thermolysis of coal at liquefaction temperatures. As precursors for this test, dibenzyldiazene and dibenzylmercury were selected. When benzyl radicals are generated in a donor solvent, the relative amounts of toluene and bibenzyl produced reflect the relative ability of the solvent to donate hydrogen and to prevent recombination. A variable amount of benzyl radical is also lost, which presumably represents that amount which adds to or combines with the solvent. Experimental evidences have shown that an additional mode of action of donor solvent is that of free radical scavenger by combination and addition reactions. Accordingly, three indices were devised to compare donor solvents: the donor, the scavenger, and combined index. The three solvent indices were determined for the decomposition of dibenzylmercury for several solvent mixtures made from different amounts of tetralin (solvent) in t-butyl benzene. The data show that the donor index increases with increasing tetralin concentration. A series of model compounds were evaluated using dibenzyldiazene as the source of benzyl radical, and results are tabulated. Another table is presented which show the donor indices obtained for several coal-derived liquefaction solvents. Taken together, these data indicate that there is good qualitative agreement between liquefaction performance and the donor index of solvents.

24875 **Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin.** Franz, J.A.; Camaioni, D.M. (Pacific Northwest Lab., Richland, WA). Contract AC06-76RL0-1830. *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 105-113(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Recent studies utilizing deuterium labelling to trace the pathways of hydrogen transport between donor solvent, coal, and model compounds promise to provide a detailed understanding of mechanistic pathways operating at the molecular level during coal dissolution in donor media. Deuterium scrambling in donor solvents constitutes a sensitive probe of the structural features of coal and mineral matter. In this paper a study of the scrambling and depletion of deuterium in reactions of a bituminous and a subbituminous coal with tetralin-1,1-d_2 is presented. Radical and ionic pathways responsible for major differences in scrambling rates for the two coals are discussed.

24876 **Isotopic investigation of the chemistry of coal hydroliquefaction.** Heredy, L.A. (Rockwell International Corp., Canoga Park, CA); Skowronski, R.P.; Ratto, J.J.; Goldberg, I.B. Contract AC22-77ET11418. *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 114-122(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

This paper presents the results of experiments which were conducted to investigate the respective roles of gas-phase and donor-solvent hydrogen in coal hydroliquefaction. Coal hydrogenation experiments were carried out with $^2H_2$/tetralin-h_{12} and $^1H_2$/tetralin-d_{12} mixtures and tetralin-d_{12} under N_2 pressure to study the mechanisms that are in operation. The following conclusions have been drawn from these measurements: (1) the relative reactivities of the α-aliphatic, β-aliphatic, and aromatic C-H bonds of tetralin at 425°C for ^1H-^2H isotopic exchange between tetralin and coal are:

75:16:9; (2) these ratios do not change significantly regardless of whether N_2 or $^1H_2$ cover gas or whether tetralin-d_{12}/$^1H_2$ or tetralin-h_{12}/$^2H_2$ reactant combinations are used.

24877 Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides. Fredrick, T.J.; Bell, A.T. (Univ. of California, Berkeley). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 124-129(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The purposes of the present work were to identify the role of molecular hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds and to demonstrate the differences in the ability of $ZnCl_2$, $ZnBr_2$, and ZnI_2 to activate H_2. Product identification was established by gas chromatography/mass spectrometry. The following conclusions may be drawn from the present study: zinc halide catalysts are active in their Bronsted acid form, e.g., $H^+(ZnX_2OH)^-$; cleavage of ether and aliphatic linkages between aromatic nuclei is indicated by protonation of the substrate and is unaffected by the presence of molecular hydrogen; hydrogen transfer to benzylic groups liberated by the cleavage of dibenzyl ether, 4-hydroxydiphenyl methane (4HDM) and 1-benzylnaphthalene (1BN) and the selectivity for forming toluene from these reactants depends on the nature of the halide used; the hydrogenation of fused-ring aromatics involves molecular hydrogen and appears to proceed via sequential protonation and hydride transfer.

24878 Hydrogen-carbon monoxide reactions in low-rank coal liquefaction. Knudson, C.L.; Willson, W.G.; Baker, G.G. (Dept. of Energy, Grand Forks, ND). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 132-141(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The data from this study support the following conclusions: (a) The shift reaction, $CO + H_2O \rightarrow H_2 + CO_2$, is not catalyzed by the reactor walls or an aromatic solvent. However the solvent does undergo some slow hydrogenation. (b) The presence of lignite catalyzes the shift reaction, but a reaction such as CO + (Oxy-Lig) $\rightarrow CO_2$ + Lig' or CO + (H_2O-Lig) $\rightarrow CO_2$ + (H_2-Lig) is favored, especially at lower temperatures. (c) The reported equilibrium values for the shift reaction decrease with increasing temperature from 28.25 at 327°C to 6.3 at 527°C. In runs without lignite, the concentration of CO steadily decreases at all temperatures with time and is at all experimental times far from an equilibrium value. With coal present, the amount of CO consumed is directly dependent on the amount of coal charged. This indicates that the coal has a certain number of reactive sites and that when they have reacted, the reaction essentially stops. While the shift reaction is no doubt occurring, it does not appear to be the most important reaction, at least not in these experiments. (d) H_2 is produced via the shift reaction in CO-H_2O systems. However, since its concentration does not increase when both H_2 and CO-H_2O reactants are present, hydrogen must be reacting. However, the net consumption of charged hydrogen is small compared to that of CO. Therefore, in competitive reactions CO reacts more rapidly than hydrogen. The preceding statements re-emphasize the fact that CO undergoes reactions with lignite that are kinetically more favorable than those with hydrogen, and that these reactions are favorable throughout the temperature range studied (350 to 480°C).

24879 Effects of calcium minerals on the rapid pyrolysis of a bituminous coal. Franklin, H.D.; Peters, W.A.; Howard, J.B. (Massachusetts Inst. of Tech., Cambridge). Contract EX-76-A-01-2295. *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 121-126(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

This paper presents results on the pretreatment of coal with calcite ($CaCO_3$) and lime (CaO). These minerals have already been shown to influence fluidized-bed pyrolysis, steam gasification, and CO_2 gasification of coal. Addition of $CaCO_3$ or CaO to coal reduces the high temperature yield of hydrocarbon products and increases the yield of CO in rapid coal pyrolysis. The former effect is probably attributable to lime-catalyzed secondary cracking reactions, while the latter results from base catalysis of a step in the decomposition of the phenolic groups. Calcite in the presence of coal decomposes to lime and CO_2 at lower temperatures than it will when pyrolyzed alone.

24880 Investigation of yields and characteristics of tars released during the thermal decomposition of coal. Freihaut, J.D.; Seery, D.J. (United Technologies Research Center, East Hartford, CT). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 133-148(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Reported results indicate that tar yields obtained from a wide variety of coals and reactor conditions can represent a significant fraction of the mass of the parent coal. Tar yields and characteristics appear to reflect not only the nature of the parent coal but also the experimental conditions of the decomposition process. The variation in tar yields and characteristics with intrinsic characteristics of the coal and process parameters underscores the possibility of relating such observations to fundamental aspects of the decomposition process. This report contains some results of an initial investigation of tar yields and properties obtained from eight coals. Results are shown for variations with (1) coal rank characteristics; (2) apparent thermal history; and (3) ambient pressure. Apparent heating rates of 10^2 C/sec to 10^3 C/sec and final temperatures of 500°C to 1780°C were utilized. Ambient pressures were varied from near vacuum to 760 torr. The results indicate that tar yields and characteristics are sensitive functions of intrinsic characteristics of the coal and the process parameters associated with the decomposition process. Prediction of tar yields may involve coal rank characteristics as a basis but the nature of the transforms introduced by the process conditions (ambient pressure, heating rate, final temperature, particle size) are equally important.

24881 Conversion of bituminous coal in CO/H_2O systems II-pH dependence. Ross, D.S.; Blessing, J.E.; Nguyen, Q.C. (SRI International, Menlo Park, CA). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 149-158(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Observations of the coal conversion study can be summarized as follows: (1) CO/H_2O systems at initial pH values above 12.6 successfully convert Illinois No. 6 coal to a product that is fully pyridine-soluble and has benzene and hexane solubilities of 50% and 18%, respectively; (2) The product gases are H_2 and CO_2. However, the expected H_2/CO_2 ratio of 1.0 based on the water gas shift reaction is not observed, with the deficit in hydrogen being found in the increased hydrogen content of the coal product; (3) These clean systems provide good elemental balances, with typically 95% coal carbon recovery and a good hydrogen balance. The ΔH/sub g/ΔO/sub l/ ratio is close to 2 in preliminary work; (4) The system with H_2 in place of CO is not effective, and potassium formate under an N_2 atmosphere is equally ineffective; (5) The products are very similar to those obtained in conventional tetralin conversions. These results can be considered from two points of view. First, it is of interest to consider the advantages this chemistry might provide in a large-scale coal conversion process. The conversion is catalytic in base, with the turnover number for OH^- (the molar ratio of H added to the coal to the quantity of base present) calculated from the values in Tables 1 and 2 to be 80 to 90. It is thus an efficient process, and while catalyzed, its homogeneous nature would avoid the common problem of catalyst fouling due to carbon deposition. The system thus has good recycle potential and small catalyst/coal loading requirements. Hydrogen is a product gas and useful for subsequent upgrading of the coal product. The second view to be taken of these results concerns the clean nature of the conversions. The system would be useful for studies in coal structure and conversion mechanisms since the recoveries are very high, and there is no organic medium to deal with. Both nmr and

mass spectrometry studies could be applied to the products from these conversions.

24882 Effects of catalysts on short contact time coal liquefaction. Thomas, M.G.; Bickel, T.C.; Granoff, B. (Sandia National Labs., Albuquerque, NM). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 173-178(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The effects of catalyst on the early stages of coal liquefaction have been described in terms of changes in dissolution and product distribution. The major points established for short-contact-time liquefaction include: (1) catalysts of some form are present during the initial stages of all direct liquefaction processes; (2) catalysts affect both dissolution (indirectly) and secondary reactions; and (3) coal-derived materials that have been formed at short times are more thermally reactive and more sensitive to subsequent catalytic treatment than coal-derived materials that have been formed at longer residence times.

24883 Preliminary characterization of catalysts tested in the H-coal bench unit. Thomas, M.G.; Sample, D.G. (Sandia Lab, Albuquerque, NM). *Fuel ;* **60**: No. 2, 145-150(Feb 1981).

Elemental analyses by emission spectroscopy were collected on five catalysts evaluated in the H-Coal catalyst-testing program. The major metal-contaminants identified were titanium, iron, boron, calcium, magnesium, and silicon. The contaminant-metals content varied from 2-5 wt% and was greatest for the American Cyanamid CoMo 1442A catalyst, least for two NiMo catalysts, and intermediate for two Amocat catalysts. The weight loss upon ignition showed an inverse relation with metals content. Surface areas of the used catalysts ranged from 20-50% of the fresh catalysts. Distribution of the metals in the used American Cyanamid 1442A catalyst was determined by electron microprobe analysis. Calcium, magnesium, and silicon were restricted to the outer 50 /mu/m of the catalyst, whereas titanium and iron concentrations reached baseline at approximately 300 /mu/m into the catalyst. 11 refs.

24884 Rapid pyrolysis and hydropyrolysis of Canadian coals. Stangeby, P.C.; Sears, P.L. (Univ of Toronto, Downsview, Ont). *Fuel ;* **60**: No. 2, 131-135(Feb 1981).

A range of Canadian coals were subjected to variable heating-rate conditions in a variety of atmospheres. Heating rate was found to have little effect on total weight loss of the coal, but a dramatic effect on the actual compositions of products. High heating rates substantially increased the yield of light hydrocarbons. 7 refs.

24885 Statistical model fitting of remote induction sounding data from underground coal gasification site--Hanna II, phases 2 and 3. Quincy, E.A.; Richmond, J.H.; Rhoades, M.L.; Rahman, M.M. (Univ of Wyo, Laramie). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Geoscience and Remote Sensing ;* **GE-19**: No. 1, 29-42(Jan 1981).

An Underground Coal Gasification Site near Hanna, WY, was sounded from the surface with a wide-band induction system to determine remotely the location, shape, and size of the coal burned. An estimated 6700 tons (148,888 ft/sup 3/) of coal 275 ft deep had been converted to low-Btu gas. A wideband loop-loop system employing pseudonoise/cross-correlation techniques was employed to combat noise and obtain time signatures. Wire grid approximations to induction models were employed to compute model responses. The reaction zone was simulated by buried metal boxes, cylinders and spheres in a conducting overburden. Box and cylinder responses were shown to be insigifnicantly different at coal seam depths and spheres proved to be unlikely candidates for fitting field data. A dual parameter Bayes minimum mean-square-error estimator was employed to estimate model dimensions from magnitude responses extracted from field data at 1 kHz. Estimates of the volumes of coal gasified compared favorably with that obtained formerly by chemical estimation. However, the burn may have deviated to the side of the gasification wells more than predicted by chemical instrumentation. Measurements taken repeatedly over a one-year span on one transverse show aging characteristics that demonstrate a migration of the conducting anomaly toward the surface. 23 refs.

24886 Kinetics of lignite pyrolysis in an entrained-flow, isothermal furnace. Scaroni, A.W.; Walker, P.L. Jr.; Essenhigh, R.H. (Pa State Univ, University Park). *Fuel ;* **60**: No. 1, 71-76(Jan 1981).

An entrained-flow, isothermal furnace was used to study rapid pyrolysis in nitrogen of a Texas lignite. Weight losses for fixed residence times up to 0.4 s were independent of particle size over the range of mean diameter from 41 to 201 /mu/m and increased with temperature elevation over the range 700 to 1000/degree/C. The maximum yield of volatiles, 66.7 wt% of the dry-ash-free coal, was particle-size independent and relatively temperature-independent over the range of operating conditions. The maximum yield represented a fractional increase of 1.30 over the ASTM volatile matter. This yield enhancement was associated with a reduction in the preponderence of secondary char-forming reactions of the volatiles and not directly with the increase in heating rate from 20/degree/C s/sup -1/ in the ASTM test to >10/sup 4// degree/C s/sup -1/ in the isothermal furnace. Pyrolysis was multistage; initial rapid devolatilization to 50% weight loss was followed by slower latter-stage devolatilization. First stage pyrolysis could be fitted by a single, first-order kinetic expression whether total weight loss was taken as just that for the first stage or for complete devolatilization. Rate constants for the two cases were 0.6*10/sup 3/ exp(-45kJ/mol/RT) and 0.9*10/sup 2/ exp(-32kJ/mol/RT)s/sup -1/, respectively. 16 refs.

24887 Conversion of solvent-refined coal to liquid products in the presence of Lewis acids. Tanner, K.I.; Bell, A.T. (Univ of Calif, Berkeley). *Fuel ;* **60**: No. 1, 52-58(Jan 1981).

The formation of liquid products from a solvent-refined coal (SRC) was studied using Lewis acid catalysts. The soluble products were characterized by elemental analysis. The effects of catalyst acidity and reaction conditions on the extent of SRC liquefaction and the composition of the soluble products are reported. 24 refs.

24888 U-gas technology status. II. Leppin, D.; Goyal, A. Chicago, IL; Institute of Gas Technology (1981). 22p. (CONF-810484—1).

From Symposium on advances in coal utilization technology IV; Denver, CO, USA (20 Apr 1981).

The Institute of Gas Technology has developed a process (the U-Gas gas process) for the direct gasification of all types of coals. The high-temperature, pressurized, single-stage fluidized-bed process can handle bituminous coals without pretreatment and attains nearly complete carbon conversion. Tests recently conducted with Western Kentucky No. 9 coal and Pittsburgh No. 8 coal in the 24-ton-per-day capacity pilot plant gasifier in Chicago have attained 98% carbon conversion and have produced medium-Btu gas of HHV above 280 Btu/SCF when operated with steam and oxygen fluidizing gases. Extensive testing has indicated the absence of tars in the product gas. Agglomerated ash particles of greater than 95% ash have been produced and removed from the gasifier in long-term continuous runs. A demonstration plant is being designed on the basis of these pilot plant results and will be constructed in Memphis, Tennessee, by the Memphis Gas, Light and Water Division under a contract to the US Department of Energy to produce 50 billion Btu/day from 3160 tons per day of Western Kentucky No. 9 coal. The demonstration plant's detailed mechanical design is in progress, and construction activities are expected to begin in the near future.

24889 Apparatus for solar coal gasification. Gregg, D.W. (to Dept. of Energy). US Patent Application 174,964. 4 Aug 1980. 27p.

Apparatus for using focused solar radiation to gasify coal and other carbonaceous materials is described. Incident solar radiation is focused from an array of heliostats through a window onto the surface of a moving bed of coal, contained within a gasification reactor. The reactor is designed to minimize contact between the window and solids in the reactor. Steam introduced into the gasification reactor reacts with the heated coal to produce gas consisting

mainly of carbon monoxide and hydrogen, commonly called synthesis gas, which can be converted to methane, methanol, gasoline, and other useful products. One of the novel features of the invention is the generation of process steam in one embodiment at the rear surface of a secondary mirror used to redirect the focused sunlight. Another novel feature of the invention is the location and arrangement of the array of mirrors on an inclined surface (e.g., a hillside) to provide for direct optical communication of said mirrors and the carbonaceous feed without a secondary redirecting mirror.

24890 **Pyrolysis of blocks of lignite.** Westmoreland, P.R.; Dickerson, L.S. (Oak Ridge Natl Lab, Tenn). *In Situ ;* **4**: No. 4, 325-343(1980).

Experiments on blocks of lignite have described phenomena which occur in addition to pyrolysis when the blocks are heated. Experimentally, internal temperatures and product yields were measured during the heating of 0.15-m-diam (6-in.) cylindrical blocks of Wilcox lignite. In the blocks, just as during underground coal gasification (UCG), steep temperature gradients formed. As a result, steam generated inside the coal from natural moisture content escaped through higher temperature char, contacting and gasifying carbon in the hotter surface region. 10 refs.

24891 **Solvent effects on the hydroliquefaction of Wyodak coal.** Miller, R.L.; Silver, H.F. (Univ of Wyo, Laramie). *Energy Sources (New York) ;* **5**: No. 3, 211-222(1980).

Results of an experimental study to measure the effect of coal-derived solvents on the noncatalytic hydroliquefaction of Wyodak coal have been correlated using a K.M. Watson type Characterization Factor (K/sub W/). Solvents with K/sub W/ near 7.8 (K)/sup 1/3/ were the most effective in liquefying Wyodak coal. However, this specific conclusion should not be generalized to all coals. The results of this work suggest the solvent K/sub W/ can be a powerful parameter in monitoring solvent effectiveness during continuous operation of a coal-liquefaction plant. 14 refs.

24892 **Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal.** Houston, TX; Coal Technology '80 Conference (1980). 775p. (CONF-801142—(Vols.5and6)). Coal Technology '80 Conference, 6006 Bellaire Boulevard, Suite 100, Houston, TX 77081.

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

The 3rd international coal utilization exhibition and conference Coal Technology '80 was held at the Astrohall, Houston, Texas, November 18-20, 1980. Volume 5 deals with coal gasification and coal liquefaction. Volume 6 deals with fluidized-bed combustion of coal, cogeneration and combined-cycle power plants, coal-fuel oil mixtures (COM), chemical feedstocks via coal gasification and Fischer-Tropsch synthesis. Thirty-six papers have been entered individually into EDB and seven also into ERA; three had been entered previously from other sources. (LTN)

24893 **Status of the COGAS process: ICGG coal gasification demonstration plant project.** Paige, W.A.; McCray, R.L.; McClintock, N.A. pp 71-91 of Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

The COGAS Process used in the Demonstration Plant combines a number of significant features which account for the high level of commercial feasibility and competitive economics projected. The more important features are as follows: Produces valuable liquid coproducts in a thermally efficient manner which are a significant proportion of the energy products (33%, Btu basis, Com'l Plant); achieves complete carbon utilization through fines control and discharge of ash as a carbon-free slag; utilizes a fluidized bed process for large scale and low risk scaleup; does not require an oxygen plant; uses low pressure for operability and reliability; is based on commercial analogs of comparable scale; and is adaptable to a wide range of coals by variation of pyrolysis conditions.

24894 **H-Coal technology, progress toward commercialization.** Wellman, P. pp 229-246 of Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

During this past summer, the largest coal liquefaction plant ever built in the US came onstream. It is also the largest direct coal hydrogenation plant ever built anywhere. Although a pilot plant, the facility is the last step necessary to establish technical and economic feasibility of the H-Coal process and to provide design data for a commercial plant. The pilot plant is located adjacent to Ashland's Catlettsbury(Kentucky) refinery and covers a 40 acre tract of land on the Big Sandy River. The plant is operated by Ashland Synthetic Fuels, Inc., a wholly owned subsidiary of Ashland Oil, Inc. The plant has been through startup and is being prepared for the first 90 day run on Illinois No. 6 coal. The H-Coal process is a development of Hydrocarbon Research, Inc. (HRI). Coal is converted by catalytic hydrogenation to substitutes for petroleum products ranging from a low sulfur fuel oil to all distillate synthetic crude, the latter representing a potential source of raw materials for the petrochemicals industry. The process is an extension of HRI's H-Oil process which is used commercially for the desulfurization of residual oils produced from crude oil refining. Depending upon the mode of operation, the product slate from the pilot plant will consist of varying quantities of liquid products ranging from propane LPG to residual fuel. The plant also produces significant quantities of gaseous fuels and operating in the fuel oil mode, a low sulfur, low ash solid fuel. Figure I is a simplified process schematic diagram of the basic H-Coal process. The processing is described briefly.

24895 **SRC-II demonstration program: a status report.** Jackson, D.M.; Schmid, B.K. pp 247-279 of Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

A 6000 T/D demonstration plant to produce liquid fuels from high-sulfur bituminous coal by the SRC-II process is now being designed. The total cost of the project, estimated to be about 1.5 billion dollars, will be shared between the United States Department of Energy, the governments of West Germany and Japan, and Gulf Oil Corporation. The governments of West Germany and Japan will each contribute 25% of the total cost, while Gulf will contribute up to 100 million dollars. The remainder of the project cost will be borne by the United States Department of Energy. The primary contract for design, construction, and operation of the plant will be assigned to a joint venture company consisting of P and M, Ruhrkohle and Veba of Germany, and Japan SRC-II, a Japanese corporation in which Mitsui Inc. is the principal firm. The plant will be designed to produce approximately 8400 barrels per day of fuel oil for use in boilers and turbines, 3800 barrels per day of naphtha suitable as reformer feedstock to make high octane gasoline, and lesser quantities of light hydrocarbons, from West Virginia coal. Design work is expected to be completed in early 1983. The major effort thus far has been to finalize the process design, so that subsequent detailed engineering can proceed. Experimental work is being pursued at the Fort Lewis pilot plant to confirm certain process features which have not yet been tested at that scale.

24896 **Coal to gasoline via Mobil MTG technology.** Palazzo, D.F. (Mobil Engineering, Princeton, NJ); Lee, W. pp 319-332 of Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

In 1976 Mobil announced the MTG process which converts methanol to high octane gasoline. The key element in the MTG process is a new, synthetic, ZSM-5 family zeolite which was discovered in our continuing search for better catalysts for petroleum processing. The new zeolite was found to have a unique channel structure which is selectively penetrated by molecules of intermediate size. The sizes of these channels are just wide enough to pro-

duce hydrocarbons in the gasoline and light distillate range. The reaction product generally terminates at a carbon number of about ten giving a high gasoline selectivity. This family of zeolites has also found application in a number of commercially available processes such as petroleum distillate dewaxing, isomerization of xylenes and disproportionation of toluene. This paper deals specifically with the use of a particular ZSM-5 zeolite in MTG and its application in the production of gasoline from coal. Mobil MTG is the first new route in forty years for the production of premium transportation fuels from coal. In 1977, Mobil, in a study funded by DOE, prepared a technical and economic comparison of the Fischer-Tropsch and MTG routes [6]. That report concluded that the Mobil technology is superior in all areas to Fischer-Tropsch: process simplicity, energy usage, thermal efficiency, gasoline selectivity, gasoline quality, investment and gasoline cost. Since the DOE study was completed, Mobil has continued to examine the effect of different variables on the process. Some of the results of these studies are presented in this paper.

24897 **Outlook for in situ gasification of eastern coal.** Martin, J.W.; McClung, J.D.; Liberatore, A.J.; Schrider, L.A. (Morgantown Energy Technol Cent, WVa). *Papers presented before the Symposium on Management ;* 74-87(1979). (CONF-7910117—).

From Coal conference and EXPO V; Louisville, KY, USA (23 Oct 1979).

The initial step to develop a first-generation in situ gasification process for deep, thin-seam, swelling bituminous coal is a test of the linked vertical well concept, Pricetown I, at the Underground Coal Gasification Test Site. During FY 1980, the field test will be completed and analyzed. 4 refs.

0106 Properties

REFER ALSO TO CITATION(S) 24848, 24860, 24869, 24948, 24957, 25054, 25056, 25455

24898 **(CONF-801263—1) Fracture flow of groundwater in coal-bearing strata.** Schubert, J.P. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 15p. NTIS, PC A02/MF A01. Order Number DE81023810.

From Symposium on surface mining hydrology, sedimentology and reclamation; Lexington, KY, USA (1 Dec 1980).

Fractures are of considerable importance to groundwater flow through lithified coal-bearing strata. Laboratory tests on core samples in many different studies in the northern Appalachians and northern Great Plains show sandstones, siltstones, shales, and claystones with air permeabilities ranging from less than 10^{-10} to 2.4 x 10^{-6} m/s. Generally, the air permeabilities were less than 10^{-8} m/s Equivalent hydraulic conductivities for most of the core samples would be one to five orders of magnitude less, because of swelling characteristics of micas, clays, and organic material in interstices when exposed to fresh water. These core tests indicate extremely low intergranular hydraulic conductivities and, in many cases, little or no difference is seen between sandstones and shales. Various aquifer tests, using wells in the same locations, invariably showed hydralic conductivities to be much greater (10^{-8} to 10^{-4} m/s) than those estimated by laboratory tecniques. In addition the hydraulic conductivity of highly fractured rock can be 10^2 to 10^3 times greater than slightly fractured rock. Even shales can be highly transmissive when extensively fractured. Rock joints and coal cleats occur in all coal basins, but their distribution and orientation may be variable. The greatest concentration of fractures usually occurs in faulted areas and in narrow fracture zones less than 100 m below ground surface. The majority of large inflows through rock into surface and underground mines occur at the faults and fracture zones. By studying and understanding more about the structural control of fractures in coal basins, the larger inflows possibly could be avoided. This would reduce pumping and water treatment costs and lessen the depletion of groundwater resources in surrounding areas.

24899 (DOE/BETC/IC—80/3(Vol.4), pp 4p, Paper 4) **Thermodynamic studies on coal conversion processes.** Good, W.D.; Smith, N.K.; Gammon, B.E.; Harrison, R.H. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

A set of heat-capacity measurements was completed on distillation fractions from the H-Coal process, and the gas solubility apparatus was modified for study of the solubility of a multicomponent gaseous mixture in fluids from the H-Coal process. Measurements of the solubility of hydrogen in the middle distillate from the SRC II process were completed. All experimental thermodynamic measurements on tolylphenylmethane were completed, and a similar investigation on isoquinoline is nearing completion. A paper was published describing heat-capacity and heat-of-combustion measurements on a number of fluids derived from coal.

24900 (DOE/BETC/IC—80/3(Vol.4), pp 6p, Paper 8) **Processing and stability characteristics of liquids from coal, shale, and heavy oils.** Sutterfield, F.D.; Brinkman, D.W.; Cotton, F.O.; Goetzinger, J.W.; Reynolds, J.W.; Steele, G.L.; Gragg, F.W. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

An important parameter influencing the potential impact of syncrudes and synfuels is their storage and thermal stability. Hydrogenation increases stability by removing nitrogen, sulfur, oxygen and metals; all of which have been shown to participate in degradation. Thus, obtaining sufficiently stable alternative liquids may dictate the degree of processing, and thus the cost. Experiments carried out at both Southwest Research Institute and Exxon have helped standardize stability test methods, have provided correlated stability characterizations of both petroleum-based and alternative liquids, and have extended the basic information on degradation mechanisms. Hydrogenation of alternate fossil liquids, especially of the first critical stage of upgrading, and initial screening of feedstocks and hydrogenation products for mutagenic activity are being studied at BETC. Hydrogenation not only increases stability, but also decreases mutagenic activity and produces a more readily refinable product.

24901 (DOE/BETC/IC—80/3(Vol.4), pp 11p, Paper 11) **Fundamental synthetic fuel stability study.** Frankenfeld, J.W.; Taylor, W.F. (Exxon Research and Engineering Co., Linden, NJ). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

A variety of organic nitrogen compounds were evaluated for their tendencies to promote sediment in hydrocarbon fuels (derived from oil-shale and coal) under accelerated storage conditions. Three types of diluents were used: pure n-decane, petroleum derived JP-8 and No. 2 diesel fuel. The fuels and fuel mixtures were stored at 110°F and 150°F in the dark. A literature search was performed to determine the state-of-the-art of storage stability with synthetic fuels and to identify the most prevalent nitrogen, sulfur and oxygen compounds found in shale and coal-derived middle distillate fuels. The effects of nitrogen compounds on sediment formation, observed previously in pure hydrocarbon systems were confirmed in broad range fuels. The most deleterious species to fuel stability were found to be alkylated heterocyclic nitrogen compounds. The most reactive compounds were those with two or more alkyl groups, at least one of which was situated on a carbon adjacent to the nitrogen. A typical, highly deleterious, compound which was studied extensively is 2,5-dimethylpyrrole (DMP). Other nitrogen compounds, such as amines, amides and non-alkylated heterocycles were non-deleterious when tested by themselves. However, several of these apparently harmless species were found to interact with deleterious nitrogen compounds to promote sediment formation. With the exception of sulfonic acids, none of the sulfur or oxygen compounds studied produced sediment when tested by themselves. However, some of them interacted with nitrogen compounds to either enhance (carboxylic acids) or retard (aromatic thiols) sediment formation.

24902 (DOE/BETC/IC—80/3(Vol.4), pp 12p, Paper 12) **Stability characteristics of hydrocarbon fuels from alternative sources.** Bowden, J.N. (Southwest Research Inst., San Antonio, TX). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

Liquid hydrocarbon fuels derived from coal and from oil shale were made available for characterization and thermal and storage stability investigations. The coal-derived liquids identified as naphthas from No. 6 Illinois and Wyodak coals produced by the Exxon Donor Solvent process contained high concentrations of oxygen, nitrogen, and sulfur compounds and were considered to be unrefined synthetic crudes. These materials were found to be relatively unstable in storage. The shale-derived fuels were refined to meet the requirements of military specification jet fuels JP-8 and JP-5 and marine diesel fuel (DFM). Virtually all the specification requirements were met and the fuels were found to be thermally storage stable. During 32-week, 43°C storage tests conducted on these liquids, periodic measurements were made of precipitate fuel-insolubles, fuel-soluble gum, dissolved oxygen content and peroxide number. The liquids were analyzed, in some instances, by infrared, NMR, and UV spectroscopy, before and after the 32-week storage test, with little or no change being observed in the bulk liquid samples. Shale-derived liquid hydrocarbons have been refined to meet current specification requirements for hydrocarbon fuels, and it appears that coal-derived liquids can also be refined to meet requirements for performance and storage stability.

24903 **(DOE/ET/10482—T1) Development of instrumental methods of analysis of sulfur compounds in coal-process streams: computer program manual for estimating concentrations of inorganic sulfur moieties from a thermodynamic data base. Quarterly technical progress report, January-March 1981.** Stutts, J.D.; Jordan, J. (Pennsylvania State Univ., University Park (USA). Dept. of Chemistry). Apr 1981. Contract AC22-77ET10482. 44p. NTIS, PC A03/MF A01. Order Number DE81023695.

This report covers the sixth quarter of a two-year contract renewal period. The substantive part of this report consists in its entirety of a user-oriented computer program manual, for estimating from a thermodynamic data base, concentrations of inorganic sulfur moieties in aqueous coal conversion process streams. Work has been completed on schedule for Task 1 (Extension and Refinement of Thermodynamic Survey and Construction of Pourbaix Diagrams). Work on Task 2 (voltammetric Methods Development), Task 3 (Enthalpimetric Methods Development), and Task 4 (Application and Technology Transfer to Coal Conversion Plants) is in progress and will be covered in subsequent quarterly reports.

24904 **(DOE/PC/30210—T1) Investigations of the changes of coal structure occurring during gasification. Progress report.** Griffiths, P.R. (Ohio Coal Research Lab. Associates, Columbus (USA); Ohio Univ., Athens (USA). Dept. of Chemistry). 26 Jun 1981. Contract FG22-80PC30210. 6p. NTIS, PC A02/MF A01. Order Number DE81025150.

The goal of this project is the development of novel methods for analyzing reacting coals by Fourier transform infrared spectroscopy, and in particular by a technique known as diffuse reflectance infrared Fourier transform (DRIFT) spectrometry developed in the laboratory of the principal investigator. The development of new hardware and software approaches for DRIFT spectrometry to optimize the study of reacting coals, and their application to monitoring the mechanisms and kinetics of the oxidation, pyrolysis and hydrogasification of coals will be investigated. Progress for this period is as follows: construction of a cell to permit gas-solid reactions to be studied from ambient temperature to 500°C; performance testing of cell and system by passing monoxide over a supported rhodium catalyst gave excellent results; oxidation of a low volatile bituminous coal was monitored and tests demonstrated that the kinetics of coal oxidation could be easily followed; several limitations in cell design were observed and will be corrected by redesigning of cell; development of a data base of diffuse reflectance spectra of analyzed coals obtained from the Penn State/DOE coal bank. Most of the experimental results obtained to date have been experiments designed to show the feasibility of the investigators' approach.

24905 **(MLM—2829(OP)) Assessment of the impact of radionuclides in coal ash.** Styron, C.E.; Bishop, C.T.; Casella, V.R.; Jenkins, P.H.; Yanko, W.H. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 15p. (CONF-810652—1; IAEA-SM—254/30). NTIS, PC A02/MF A01.

From International symposium on health impacts of different sources of energy; Nashville, TN, USA (22 Jun 1981).

An assessment of the potential environmental and health impacts of radionuclides in the coal fuel cycle is being conducted at Mound. This paper describes our studies evaluating the potential for migration of radionuclides from ash disposal sites. Studies at a power plant burning western US coal dealt with an assessment of potential radiation doses from coal ash ponds and leachate discharges of radionuclides from the ponds. Emanation of radon-222 from the ash is relatively low. The emanation of radon-222 from the ash pond (radium-226 at 4.5 pCi/g) is predicted to be about six times less than from soil (radium-226 at 1 pCi/g). Ash with radium-226 at 25 pCi/g would approximate emanation of radon-222 from soil. At 1000 m from the center of the ash pond area, radon-222 from the ash pond is predicted to be 1000 to 6000 times less than background (0.1 to 0.5 pCi/liter). Pathways exist for transport of radionuclides leached from ash into the aquifer beneath the holding ponds, but concentrations of radionuclides in water leaving the pond are lower than concentrations in groundwater which is upgradient of the ponds. Leachability of the ash is quite low, on the order of 0.002% in one month, and flow of ash sluicing water (3% of the volume of the ponds each day) has actually diluted normal background concentrations of radionuclides in the aquifer between the ponds and the adjacent river.

24906 **(PB—81-111585) A statistical study of coal sulfur variability and related factors. Final report.** Warholic, G.R.; Morton, J.E.; Ngan, Y.; Spearman, J.E.; Harris, Y. (Foster Associates, Inc., Washington, DC (USA)). May 1980. Contract EPA-68-02-2592. 265p. NTIS, PC A12/MF A01.

Coal analysis data and power plant continuous monitoring data were gathered, reviewed and analyzed to assess the impact of fuel coal characteristics on compliance strategies and emission regulations. Coal analysis data, on a raw and washed basis, were analyzed by individual mine, composite coal seams and USBM Producing Districts. The results indicated that composite coal seam or Producing District data cannot be used to accurately predict sulfur variabilities for individual mines. Analyses indicated that the heat content (Btu/lb) was best approximated by the normal distribution, which the sulfur content and pounds sulfur/MMBtu were best represented by the inverted gamma distribution which was slightly superior to the lognormal distribution. Analysis of available continuous monitoring data supported the inverse relationship between coal sulfur variability and lot size, i.e., significant reductions in relative variability of emissions occur as the averaging time increases. The continuous monitoring data indicate that while FGD systems reduce mean emission levels, the relative variabilities of outlet SO2 concentrations are substantially greater than those of inlet SO2 concentrations. The various analyses of coal sulfur variability identified no reliable method for coal suppliers or consumers to predict variability which may be critical for compliance by some coal-fired boilers to existing sulfur emission-limiting regulations.

24907 **Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks.** Hayatsu, R.; Winans, R.E.; McBeth, R.L.; Scott, R.G.; Moore, L.P. (Argonne National Lab., IL). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 4-9(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

To better understand the transformation of aliphatic rich materials and lignin-like polymers during catagenesis, oxidative degradation studies of lignite, subbituminous and bituminous coals were carried out using different oxidants. For comparison with coal oxidation, Green River kerogen and softwood and hardwood lignins were oxidized. In order to determine how phenolic structures in lignins and lignin-like polymers have been altered during the evolutionary stages of diagenesis, catagenesis and metagenesis, lignin or lignite coal was heated with clay minerals to produce artificial coalification products. An oxidative degradation study of these artificial coalification products provided some evidence which helps elucidate the alteration of phenolic structures during catagenesis. Conclusions from the present and previous studies are: (1) at least this lignite and subbituminous coal contain aliphatic rich materials

which might have been derived from lipids. Such materials are no longer identifiable in higher rank coals except cannel coal, because of extensive degradation during catagenesis. Indeed, trapped volatile compounds extracted from bituminous coals are predominantly aliphatic hydrocarbons which are considered to be degradation products from the macromolecular materials. However, lignite and anthracite coals contain much less of these hydrocarbons. During catagenesis aliphatic carbon chains and alicyclics in kerogen are released successively forming crude oil and gas;(2) During diagenesis and early catagenesis lignin polymers are transformed to lignin-like polymers which are incorporated into the low rank coal macromolecules. At a later stage of catagenesis, these polymers have lost their lignin-like nature as a result of continued and extensive transformation.

24908 **Novel method for controlled oxidation.** Benjamin, B.M.; Raaen, V.F. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 16-19(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

A novel method for the oxidative degradation of coal or other organic material is described. The procedure is potentially useful for structure determination. As originally conceived, this method was intended for use with aqueous potassium permanganate as oxidant, but it is equally applicable with other oxidizing agents. Sodium hypochlorite can be substituted for $KMnO_4$ except that controlling the pH and monitoring the end point become more difficult. Results with potassium permanganate only are described here but sodium hypochlorite was tried. An advantageous feature of the method is the simultaneous removal of soluble products from further contact with oxidizing agent as the oxidizing agent attacks the substrate. In principle, the experimental approach resembles that of column chromatography. The compounds were characterized by nuclear magnetic resonance measurements, and gas chromatography.

24909 **Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid.** Venier, C.G.; Squires, T.G.; Chen, Y.Y.; Shei, J.C.; Metzler, R.M.; Smith, B.F. (Ames Lab., IA). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 20-25(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Hydrogen peroxide in trifluoroacetic acid (peroxytrifluoroacetic acid) is known to rapidly degrade the aromatic portions of molecules leaving the aliphatic skeleton intact. This means of oxidation was found useful in determining the kinds and amounts of organic sulfur functional groups in coal. Aromatic rings directly attached to sulfur in coal survived less than exhaustive oxidation and appeared in the products as sulfones and sulfonic acids. Since the rest of the aromatic structure of coal are completely oxidized, the higher molecular weight portion of the products are compounds enriched in sulfur. These compounds were characterized by gas chromatography, flame photometric and flame ionization detection.

24910 **Oxidations of Illinois No. 6 coal at and below 60°C.** Mayo, F.R.; Pavelka, L.A. (SRI International, Menlo Park, CA). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 31-34(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The objective of this research program is to determine the nature of the singly-bonded connecting links between the condensed aromatic and hydroaromatic ring systems in Illinois No. 6 coal. A previous study showed that Illinois No. 6 coal can be largely converted to soluble material by cleavages at ether and ester bonds, without loss of carbon, at or below 50°C. For further breakdown of connecting links in both dissolved and undissolved fractions, several oxidation methods are effective at 30 to 50°C. Aqueous NaOCl gives the fastest and most complete reaction and some of the lowest losses as CO_2. 34% nitric acid is most selective in attacking aliphatic material (connecting links); the yield of black acids can probably be improved by use of more and shorter oxidation steps between separations of oxidation products. The highest selectivity in the removal of aromatic material was in NaOCl oxidation 3 at pH 10, but with high loss of carbon. Oxidation with potassium butoxide (K-O-t-Bu) in dimethyl sulfoxide also appears to remove aromatic material preferentially but the change in H/C ratio is limited by low formation of CO_2. Selective oxidation at low temperatures appears to have great potential for making coal soluble at low temperatures for further investigation, with only 10 to 20% loss of carbon, either by preferential destruction of connecting links or of key rings in condensed systems (perhaps leaving most of the aliphatic connecting links intact). A combination of $F_3C\text{-}CO_2H$, H_2O_2, and H_2SO_4 is notable for removing aromatic material from coal but its potential in making coal soluble with minimum loss of carbon is unknown to the investigators.

24911 **Chemical studies of the Ames oxydesulfurization process.** Squires, T.G.; Venier, C.G.; Chang, L.W.; Schmidt, T.E. (Ames Lab., IA). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 50-59(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The validity of the Ames claim of up to 40% removal of organic sulfur from coal was assessed by subjecting model compounds to the Ames Process which utilizes 0.2 M aqueous Na_2CO_3 at 150°C under pressure of 300 psi O_2 for one hour. This type of oxydesulfurization has been described as a two step process involving initial oxidation at sulfur to produce sulfoxides and sulfones. This step is then thought to be followed by the thermal and, in the Ames Process, base assisted extrusion of SO/sub x/. In this concept, the initial oxidation at sulfur facilitates desulfurization by polarizing and weakening the carbon to sulfur bond. The conclusions concerning the oxydesulfurization process are: (1) thiophenols and disulfides are the only groups oxidized at sulfur; (2) sulfides, including thiophenes, are not oxidized at sulfur; (3) reactive sulfides are oxidized at reactive carbon-hydrogen bonds; (4) reactive carbon-hydrogen bonds in functions not containing sulfur also react; (5) the Ames Process is directly analogous to hydrocarbon autoxidation; and (6) more efficient sulfur removal without severe degradation of the coal is not possible under the present process conditions. The success which these model compound studies have had in defining the limits of the efficacy of the Ames oxydesulfurization process encourage one to believe that this approach will be quite valuable in the evaluation of other proposed chemical coal cleaning techniques.

24912 **HPLC and phase transfer catalysis in the analysis of oxidation products of lignite liquids and model compounds.** Olson, E.S.; Farnum, B.W. (Dept. of Energy, Grand Forks, ND). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 1, 60-66(29 Mar 1981). (CONF-810308—(Vol.3)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The objective of these studies was to develop new methods for the analysis of the types and quantities of aryl groups and alkyl groups present in the alkylarenes and hydroarenes which are major constituents of the liquefaction products derived from lignite coals. A number of oxidation reactions of light oil hydrocarbon mixtures and model compounds were investigated using trifluoroperacetic acid, ruthenium tetraoxide, ceric ammonium nitrate and permanganates as oxidizing agents. In order to get high yield oxidation reactions, phase transfer catalysts were utilized in some of the reactions. Derivatization of the reaction products to give highly uv absorbing compounds facilitated the analysis of the products with high power liquid chromatography (HPLC).

24913 **Coal classification by HPLC and three-dimensional detection.** Sepaniak, M.J.; Yeung, E.S. (Ames Lab., IA). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 1-6(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The goal of this work is to characterize the asphaltenes derived from various solvent refined coals, so that similarities and differences between various refining processes can be identified. Such information can lead to the optimization of the processing conditions, improved quality control, reduced environmental pollution, and the understanding of the fundamental chemical reactions involved. For these studies standard commercial reversed-phase high powered liquid chromatography columns (HPLC) were selected. The use of a pre-column switching technique prolonged column life and reduced contamination. The use of multidimensional detectors allowed the extraction of a maximumm amount of information, and the high sensitivity of the detectors allowed small injection quantities. The following three optical detectors were used which complemented one another in the type of information provided; conventional uv absorption detector operating at 254 nm; laser-excited fluorimetric (LF) detector that has a detectability in the picogram range; two-photon excited fluorometric (TPF) detector with detectability in the nanogram range but picograms levels can be achieved if high-power pulsed lasers are used. Chromatograms from each of the three detectors for a particular run showed that information obtained from each is quite independent and complement one another. Chromatograms for the four different samples studies, all from the LF detector, are presented. A more objective comparison was made using pattern recognition analysis. The results are presented in tabular form.

24914 Separation and characterization of lignite derived preasphaltenes by gel permeation chromatography and nuclear magnetic resonance spectrometry. Baltisberger, R.J.; Patel, K.M.; Wettlaufer, D.G.; Rovang, J.W.; Woolsey, N.F.; Stenberg, V.I. (Univ. of North Dakota, Grand Forks). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 38-48(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Preasphaltenes for purposes of this study are defined as that portion of a lignite derived product which is soluble in tetrahydrofuran but insoluble in toluene. The preasphaltenes studied would fall into the seventh and eighth fractions of the sequential elution by solvent chromatography (SESC) procedure. The preasphaltene fraction was chromatographed for size separation using Bio-Beads S-X3 columns and pyridine as the eluent. The distribution and functionality of nitrogen and oxygen were then monitored in the molecular size fractions formed at different operating conditions. The study shows the structure and distribution of oxygen is the most important parameter. Work was centered on the development of procedures of the quantitation of oxygen functionality in this material. For this report it was only possible to identify the amount of phenolic hydroxyl groups present. Gel permeation chromatography offers the opportunity to observe subtle changes in preasphaltene structure that would be rather difficult to observe by another procedure. The postulated aromatic core plus ether links polymer structure requires precise information about the concentration of phenolic sites as they change with molecular weight. The type of preasphaltene structure suggested by this study would explain why preasphaltenes are insoluble in benzene even through their acidities, bascities and fraction of aromatic carbons may be equal to those of asphaltenes. Their insolubilities result from ether and furan linkages locking the aromatic systems into very rigid condensed molecules.

24915 Separation and characterization of polycyclic aromatic hydrocarbons and alkylphenols in coal derived solvents. Hurtubise, R.J.; Allen, T.W.; Hussain, A.; Silver, H.F. (Univ. of Wyoming, Laramie). Contract AC01-79ET14874. *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 55-58(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Dry-column chromatography with an aluminum oxide stationary phase and a n-hexane-ether (19:1) mobile phase was used to separate polycyclic aromatic hydrocarbons (PAH) by ring size. Prior to the dry-column chromatography step, the coal derived solvents were added to an acid treated silica gel column and eluted with chloroform. This step removed pyridine-type nitrogen heterocycles. After separation of the individual ring fractions, the fractions were further separated by either thin layer chromatography (TLC) or high performance liquid chromatography (HPLC). If TLC was used, then after separation fluorescence profiles of each PAH ring fraction distributed on 30%-acetylated cellulose chromatoplates were obtained with a spectrodensitometer. Measurement of fluorescence peak heights gave an approximate measure of the amount of the 3-, 4-, 5-, and 6- ring PAH. For HPLC separation, the 3- and 4- ring PAH fractions obtained from the dry-column chromatography step were separated with a μ-Bondapak C_{18} column and methanol:water (65:35) mobile phase. The HPLC separated PAH were characterized by chromatographic correlation factors and corrected fluorescence excitation spectra. Alkylphenols were identified in coal recycle solvent sample following separation by HPLC.

24916 Coal structure cleavage mechanisms: scission of diphenylmethane and diphenyl ether linkages to hydroxylated rings. McMillen, D.F.; Ogier, W.C.; Ross, D.S. (SRI International, Menlo Park, CA). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 181-190(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The scission of strong carbon-carbon and carbon-oxygen bonds in hydroxydiphenylmethanes and diphenyl ethers during reaction in tetralin at 400°C has been shown to occur via ionic tautomerization to the respective keto forms which can undergo homolytic scission at rapid rates. In the case of the hydroxydiphenylmethanes, the tautomerization is rapid and constitutes a pre-equilibrium, but in the case of hydroxydiphenyl ethers, the tautomerization is slower and constitutes the principal rate-controlling step. Consistent with this picture, additives known to increase the rates of ring-hydrogen exchange in phenols have no effect on the decomposition rate of hydroxydiphenylmethanes, but markedly accelerate the rate of C-O bond scission in hydroxydiphenyl ethers. This latter observation suggests that the sometimes beneficial effects of added phenolsdiphenyl ethers. This latter observation suggests that the sometimes beneficial effects of added phenols in coal-conversion processes may be due, in part, to increased rates of tautomerization in diphenyl ether structures analogous to those studied in this work. Finally, an understanding of these and other details of the homogeneous decomposition mechanisms of hydroxydiphenylmethanes and hydroxydiphenyl ethers now provides a sound basis for elucidating the mechanism(s) of the facile heterogeneous cleavage that takes place in the presence of iron oxide surfaces.

24917 Trace metal distribution in fractions of solvent-refined coal by icp-oes and implications regarding metal speciation. Hausler, D.W.; Hellgeth, J.W.; Taylor, L.T.; Borst, J.; Cooley, W.B. (Va Polytech Inst and State Univ, Blacksburg). *Fuel ;* **60**: No. 1, 40-46(Jan 1981).

In an effort to understand the chemical state of the organometallic species suspected to reside in coal-derived materials, the metal distributions (20 elements) in various functionalized SRC fractions were examined. The majority of elements was found concentrated in the acid fraction. 10 refs.

24918 Relation between coal aromatic carbon concentration and proximate analysis fixed carbon. Solomon, P.R. (United Technol Corp, East Hartford, Conn). *Fuel ;* **60**: No. 1, 3-6(Jan 1981).

The aim of this study was to establish the relation between coal structure and fixed carbon. Good agreement has been obtained between measured proximate analysis values for fixed carbon (FC) and the predictions of a thermal decomposition model. The model provides a basis for understanding the relation between FC and coal structure and between FC measured under proximate analysis conditions and coke or char measured in other thermal decomposition experiments. 25 refs.

24919 **Investigation of aqueous sodium dichromate oxidation for coal structural studies.** Hayatsu, R.; Winans, R.E.; Scott, R.G.; McBeth, R.L.; Moore, L.P. (Argonne Natl Lab, Ill). *Fuel ;* **60**: No. 1, 77-82(Jan 1981).

The oxidative degradation rates of coals were studied. To determine optimum conditions, the aqueous Na/sub 2/Cr/sub 2/O/sub 7/ oxidation as applied to coals, coal products, model compounds and polymers was investigated in detail. It was found that this oxidation preferentially attacks aliphatic and alicyclic methylene linkages with minimum degradation of most aromatic ring systems. 21 refs.

24920 **Carbonylation studies with Illinois No. 6 bituminous coal.** Duty, R.C.; Hussmann, G.P.; Austin, J. (Ill State Univ, Normal). *Fuel ;* **60**: No. 1, 83-87(Jan 1981).

Sodium metal and carbon dioxide were used to carbonylate Illinois No. 6 coal in a 1 l, high-pressure, autoclave in anhydrous tetrahydrofuran from 150 to 350/degree/C. Solubility of the reaction products in tetrahydrofuran and water, and the sodium uptake in the insoluble residue were determined. The reduction and subsequent carbonylation of coal produced a limited amount of solubility in these solvents. 14 refs.

24921 **Oxidative degradation of coal; the role of hydrogen in coal chemistry.** Washington, DC; American Chemical Society (1981). 153p. (CONF-810308—(Vol.3)). University Microfilms, Ann Arbor, MI, $8.00.

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Eight papers presented at each of the two symposia, Oxidative Degradation of Coal and the Role of Hydrogen in Coal Chemistry which dealt mainly with the chemistry of coal liquefaction are abstracted separately.

24922 **Chromatography of coal derived products: general papers.** Washington, DC; American Chemical Society (1981). 202p. (CONF-810308—(Vol.4)). University Microfilms, Ann Arbor, MI $8.00.

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Twenty papers presented at the Symposium on Chromatography of Coal Derived Products are abstracted separately. These covered liquid column chromatography and gas chromatography/mass spectroscopy for separation and characterization of coal derived products.

0108 Waste Management

REFER ALSO TO CITATION(S) 24844, 24846, 24933, 24949, 24954, 25453, 25455, 25456, 25457, 25458, 25840, 26174, 26203

24923 **(AD-A—090419) Disposal of soluble salt waste from coal gasification.** McKnight, C.E. (Army Armament Research and Development Command, Aberdeen Proving Ground, MD (USA). Chemical Systems Lab.). Jun 1980. 14p. NTIS, PC A02/MF A01.

This paper addresses pollutants in the form of soluble salts and resource recovery in the form of water and land. A design for disposal of soluble salts has been produced. The interactions of its parameters have been shown by a process design study. The design will enable harmonious compliance with United States Public Laws 92-500 and 94-580, relating to water pollution and resource recovery. In the disposal of waste salt solutions, natural water resources need not be contaminated, because an encapsulation technique is available which will immobilize the salts. At the same time it will make useful landforms available, and water as a resource can be recovered. There is a cost minimum when electrodialysis and evaporation are combined, which is not realizable with evaporation alone, unless very low-cost thermal energy is available or unless very high-cost pretreatment for electrodialysis is required. All the processes making up the proposed disposal process are commercially available, although they are nowhere operating commercially as one process. Because of the commercial availability of the processes, the proposed process may be a candidate 'best commercially available treatment' for soluble salt disposal.

24924 **(CONF-8006171—1) Biological removal of organic constituents in high-Btu coal gasification wastewaters.** Stamoudis, V.C.; Luthy, R.G. (Argonne National Lab., IL (USA); Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Civil Engineering). 1980. Contract W-31-109-ENG-38. 21p. NTIS, PC A02/MF A01. Order Number DE81023574.

From International conference on water pollution research; Toronto, Canada (23 Jun 1980).

Studies have been initiated to assess the efficiency of activated sludge treatment for removal of organic contaminants from coal gasification process effluents. Samples of pilot plant raw gas quench wastewater were obtained from the Institute of Gas Technology's HYGAS process and from the Grand Forks Energy Technology Center (GFETC) slagging fixed-bed process. These wastewaters were subjected to long term biological treatability studies, followed by detailed characterization of organic constituents. The samples were extracted using a methylene chloride pH-fractionation method to neutral, acidic, and basic fractions for analysis by capillary column gas chromotography/mass spectrometry. Influent acid extract samples of both HYGAS and GFETC wastewaters showed that nearly 99% of the total extractable and chromatographable organic material was comprised of phenol and alkylated phenols. Activated sludge treatment removed these compounds almost completely. Influent base extracts of HYGAS and GFETC samples showed alkylated pyridines, anilines, and quinolines; the GFETC sample also showed, as major components, aminopyrroles, imidazoles and/or pyrazoles, and diazines. Removal efficiency of these compounds was generally good, with the exception of certain alkylated pyridines. The influent neutral fractions of both the HYGAS and GFETC samples were comprised of cycloalkanes, cycloalkenes, naphthalene, indole, acetophenone, and benzonitrile. Alkylated benzenes, abundant in the HYGAS sample, were generally absent in the GFETC sample. Removal efficiencies for certain alkylated benzenes, polycyclic aromatic hydrocarbons, and cycloalkanes and cycloalkenes were poor, especially at low influent concentrations.

24925 **(CONF-8006171—2) Efficacy of activated sludge/powdered activated carbon for removal of organic constituents in wastewater from commercial-scale, high-Btu coal gasification plant.** Harrison, W.; Ford, D.L. (Argonne National Lab., IL (USA); Engineering-Science, Inc., Austin, TX (USA)). 1980. Contract W-31-109-ENG-38. 15p. NTIS, PC A02/MF A01. Order Number DE81023575.

From International conference on water pollution research; Toronto, Canada (23 Jun 1980).

Bench-scale, activated-sludge (AS) treatability studies indicate that approximately 98 percent of total organic constituents can be removed from wastewater generated by HYGAS and slagging-type, high-Btu coal gasification pilot plants. This suggests that the most important unit of a wastewater treatment system for organics removal in commercial-scale versions of such plants will be the AS unit, augmented by powdered activated carbon (PAC) addition for control of refractory organics. The entire treatment train will probably have the configuration: API separator, phenol extraction, ammonia stripping, dissolved-air flotation, AS/PAC, and suspended solids separation. Taking the standard coal gasification plant as one producing 250 x 10^6 scfd of product gas, and the amount of quench and shift-condensate water delivered to the activated sludge unit as 2.8 MGD, the annual cost of removing organics by AS/PAC for such a commercial-scale plant is estimated at $2,500,000. The estimated annual energy impact for the equalization basin, the AS/PAC system, and for regeneration is estimated at 10.1 x 10^6 kWh(e), or 17.4 x 10^3 bbl crude oil equivalent. Together with the other process units in the overall treatment train, it is probable that the AS/PAC system can ensure environmental control of both major and trace organic constituents at acceptable levels. Additional bench-scale treatability studies should be conducted to confirm this supposition, however.

24926 (EPA/600/9—81-019B) Proceedings: symposium on flue-gas desulfurization. Ayer, F.A. (comp.). (Research Triangle Inst., Research Triangle Park, NC (USA)). 1980. 565p. (CONF-8010105—(Vol.2)). NTIS. Order Number DE81903401.

From Symposium on flue gas desulfurization; Houston, TX, USA (28 Oct 1980).

The two-volume proceedings document presentations at EPA's Sixth Symposium on Flue Gas Desulfurization (FGD), October 28-31, 1980 in Houston, Texas. Presentations covered such subjects as approaches for control of acid rain, the Nation's energy future, economics of FGD, legislative/regulatory developments, FGD research/development trends, FGD system operating experience, FGD byproduct disposal/utilization, developments in dry FGD, and industrial boiler applications. Twenty-two papers from Volume 2 have been entered individually into EDB and three also into ERA.

24927 (EPA/600/9—81-019B, pp 657-693) **Potential effects on groundwater of fly ash and FGD waste disposal in lignite surface mine pits in North Dakota.** Groenewold, G.H. (Geological Survey, Grand Forks, ND); Cherry, J.A.; Manz, O.E.; Gullicks, H.A.; Hassett, D.J.; Rehm, B.W. 1980. NTIS.

From Symposium on flue gas desulfurization; Houston, TX, USA (28 Oct 1980).

In this study, the potential impacts of surface mine pit disposal of fly ash and FGD waste at the Center Mine near Center, North Dakota, are being evaluated. The FGD waste is generated by using the highly-alkaline fly ash as the SO_2 sorbent. The research involves field studies, laboratory studies, and computational geochemical studies to determine the potential for FGD waste and fly ash to affect groundwater quality. FGD waste from North Dakota lignite, when placed in contact with water in various types of laboratory experiments, produces leach fluids with high SO_4, Mg and Na concentrations and pH values in the range of 7.0 to 8.5. Toxic metal and non-metal concentrations are generally not significantly in excess of drinking water standards. The concentrations of SO_4 and Ca are limited by the solubility of gypsum in conjunction with the degree of ion pairing between the major cations and sulfate. Highest total dissolved solids occur when Na and Mg are present as soluble sulfate salts. In contrast, North Dakota lignite fly ash produces leach water that is very toxic because of extremely high pH and very high concentrations of As, Se and Mo. Environmentally safe disposal of fly ash and FGD waste in surface mine pits will require careful site selection and selective placement of wastes and the various overburden materials.

24928 (EPA/600/9—81-019B, pp 701-710) **Government procurement of cement and concrete containing fly ash.** Hansen, P.; Heffelfinger, J. (Environmental Protection Agency, Washington, DC). 1980. NTIS.

From Symposium on flue gas desulfurization; Houston, TX, USA (28 Oct 1980).

The main recommendation is that agencies allow either blended cement or concrete containing fly ash to be bid as an alternate material to portland cement or concrete, except where the application would be technically inappropriate. The bidding mechanism will then determine whether cement and concrete containing fly ash is in fact available and at competitive prices. We further recommend that when, and if, a procuring agency becomes satisfied that cement and concrete containing fly ash is indeed available at a price competitive with that of portland cement or concrete, only bids for cement or concrete containing fly ash should be solicited. The cost savings from the use of fly ash would allow suppliers of cement and concrete containing fly ash to compete favorably with portland cement and concrete suppliers in equal bidding situations. Another issue of significant concern quality control. Quality control and assured performance are difficult problems with any concrete mix design. The use of fly ash complicates the problem since the quality of the ash must be tested and adjustments must be made in the mix design. However, ample specifications and testing methods exist for ensuring the quality of the fly ash and the resulting cement or concrete containing fly ash. We definitely feel that only those ashes which, as a minimum, meet ASTM specifications should be used in cement and concrete. In addition let us not forget that suppliers are responsible for ingredient quality and for meeting the appropriate performance standards. (LTN)

24929 (IS—4773) Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980. Burnet, G.; Weiss, S.J.; Murtha, M.J. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 36p. NTIS, PC A03/MF A01. Order Number DE81025523.

The purpose of this research is to develop methods to process fly ash for the separation and use of an iron-rich fraction, for the recovery of metals, primarily Al and Ti, and for use of the process residues. Research during this report period of the HiChlor process for the extraction of alumina and titania by high-temperature chlorination of a fly ash-reductant mixture included investigation of the simulation of the reactions as a design tool, the assembly of a unit to measure reaction kinetic rates and particle specific surface areas and porosities, and the design of equipment to measure necessary chloride product separation data. A pretreatment chlorination reaction using CO and Cl_2 was found to be capable of removing 80% of the iron with only minimal alumina and silica reaction. Development of the lime-soda sinter process includes the collection of data on the phenomenon of auto-disintegration of lime-fly ash sinters. Results indicate that it is the presence of minor constituents having +5 pr +6 valence cations of a size that can enter the lattice of the calcium silicate which prevent sinter auto-disintegration.

24930 (PB—81-114043) Chemical and biological characterization of leachates from coal solid wastes. Final report Sep 76-Jun 79. Griffin, R.A.; Schuller, R.M.; Suloway, J.J.; Shimp, N.F.; Childers, W.F. (Illinois State Geological Survey, Urbana (USA)). Mar 1980. Contract EPA-68-02-2130. 112p. NTIS, PC A06/MF A01.

The report gives results of the chemical and mineralogical characterization of coal solid wastes. The wastes included three Lurgi gasification ashes, mineral residues from the SRC-1 and H-Coal liquefaction processes, two chars, two coal-cleaning residues, and a fly-ash-and-water-quenched bottom ash (slag) from a coal-fired power plant. Leachates generated from the solid wastes at eight pH levels and under two different gas atmospheres were analyzed for more than 40 chemical constituents. Thermodynamic speciation of inorganic tons and complexes in solution were modeled. The modeling demonstrated that similar mineral phases controlled the aqueous solubility of the major ionic species for all wastes. Adsorption and co-precipitation of trace metals with iron, manganese, and aluminum oxides and hydroxides were thought to be the likely controls on trace metal concentrations in the leachates. A high degree of attenuation of the leachates constitutes by soils was observed. Soil properties controlled the degree of attenuation to a greater extent than did the chemical concentrations of the leachates. Results of acute 96-hour static bioassays using fathead minnows identified mortality as being caused by the combined effect of pH and total ionic strength of the leachate.

24931 Use of macroreticular resin for separation of coal conversion process wastewater. Tang, J.I.S. (Univ. of Southern California, Los Angeles); Kawahara, F.K.; Yen, T.F. *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 49-54(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The pre-separation of organics in coal wastewater macroreticular resins is due to the following reasons: (1) it has a homogeneous surface, permitting the operation of only one adsorption mechanism at a time; (2) the large surface area produces high exchange capacity as well as good chemical and structural stability; and (3) no high energy process (such as heat) is used which might alter the nature of the organic solutes or evaporate the volatile compounds which have relatively low boiling points. The polymer resin used in this study is able to fractionate organic solute mixtures into more homogeneous fractions based on sorption mechanisms without serious alteration of the solutes or solute matrix. The general theory that hydrophobic (HO) or nonpolar molecules are attracted to hy-

drophobic surfaces, and hydrophilic (HI) or polar molecules to hydrophilic or polar surfaces, is adopted in this scheme. Thus adsorbents of intermediate polarity such as Amberlite XAD-7 and XAD-8 have an attraction for molecules of completely hydrophobic nature, or essentially hydrophobic compounds with some polar functionality. To adsorb hydrophilic compounds of polar of neutral functionalities, ion exchange resins were used. The total organic carbon data indicate the recovery efficiency is ca. 70 to 80%. The significant information is that the compounds found in the six fractions are largely different. This demonstrates that a sample method for characterizing the chemical nature of coal-derived wastewater effluents is available. A drawback of the present method is that species do absorb strongly at the resin surface sites and cannot recover completely with most powerful eluents such as acids and bases. Another inconvenience is that the inorganics contained in the wastewater will alter the sorbing nature of the macroreticular resin.

24932 **Recovery of aluminum and other metal values from fly ash.** McDowell, W.J.; Seeley, F.G. (to Department of Energy). US Patent 4,252,777. 24 Feb 1981. Filed date 1 Nov 1979. vp.

PAT-APPL-090175.

The invention described herein relates to a method for improving the acid leachability of aluminum and other metal values found in fly ash which comprises sintering the fly ash, prior to acid leaching, with a calcium sulfate-containing composition at a temperature at which the calcium sulfate is retained in said composition during sintering and for a time sufficient to quantitatively convert the aluminum in said fly ash into an acid leachable form.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 24857, 24905, 24968, 26149, 26297

24933 **(IS-M—309) Assessment of the environmental impact of power plant fly ash.** Murtha, M.J.; Burnet, G. (Ames Lab., IA (USA); Iowa State Univ. of Science and Technology, Ames (USA). Dept. of Chemical Engineering). 1980. Contract W-7405-ENG-82. 17p. (CONF-801210—28). NTIS, PC A02/MF A01. Order Number DE81023777.

From 3. Miami international conference on alternative energy sources; Miami Beach, FL, USA (15 Dec 1980).

The disposal of large amounts of coal fly ash is an environmental problem of increasing magnitude. The two principal reasons for environmental concern are the entry of heavy metals from fly ash into the soil and water supplies, and radiation from the naturally occurring radionuclides in fly ash. Currently, about 50 million tons per year of coal fly ash are being produced in the United States, and it is estimated that the increased consumption of coal will raise fly ash production to approximately 60 and 150 million tons per year by 1985 and 2000, respectively. Only about 17 percent of the fly ash produced annually is presently being used and this largely for construction purposes. The 1976 Resource Conservation and Recovery Act (RCRA) deals with the management of solid and hazardous wastes, and encourages energy and resource recovery. Recent research has indicated that solid wastes from coal combustion, including fly ash, could be classified as hazardous under present EPA definitions. The seriousness of this possibility has been recognized and new rules for coal ash waste disposal are being considered. Ames Laboratory research on fly ash utilization as an alternative to disposal includes extraction of metals from the ash and discovery of uses for the process residues. Recovery of alumina and iron oxides by physical and chemical processing would permit large scale utilization of fly ash and help reduce dependency on imports. This paper deals with the environmental impact of coal combustion and fly ash disposal, the current status of relevant legislation and regulations, and ash utilization process development. A process being developed at the Ames Laboratory for metals recovery from fly ash is described.

24934 **(LBL—11896) Modeling of static mining subsidence in a nonlinear medium.** Ratigan, J.L.; Goodman, R.E. (California Univ., Berkeley (USA). Dept. of Civil Engineering). Dec 1980. Contract W-7405-ENG-48. 17p. (CONF-810817—1). NTIS, PC A02/MF A01.

From Implementation of computer procedures and stress-strain laws in geotechnical engineering conference; Blacksburg, VA, USA (3 Aug 1981).

Applications of the conventional finite element method to problems of mining subsidence can result in excessive expense, particularly when nonlinear constitutive stress/strain relations are used for the geological medium. An alternative finite element method is proposed which captures the essential characteristics of subsidence observed both in more sophisticated finite element programs and in the field. The alternative method treats the overburden with classical beam theory with the inclusion of shearing deformation. The nonlinear axial response of the pillars as well as the nonlinear response of any backfill that may be present is also modelled. Flexural and bending modes of deformation are included for the pillar and backfill media with classical beam theory. Shearing deflections are also included for these structural members. The development of the constitutive relations, the implementation of the constitutive relations in the computer program and the numerical algorithm for the problem solution are presented. An example problem in subsidence is presented to illustrate the potential of the computer program. Computer cost for the example problem clearly demonstrates that the alternative method for analysis of subsidence problems deserves consideration.

24935 **(PB—81-111593) A statistical study of coal sulfur variability and related factors - documentation for the coal sulfur variability data base and analytical program. Final report.** Warholic, G.R.; Morton, J.E.; Ngan, Y.; Spearman, J.E.; Harris, Y. (Foster Associates, Inc., Washington, DC (USA)). May 1980. Contract EPA-68-02-2592. 254p. NTIS, PC A12/MF A01.

The report describes the data structure and the analytical program developed by Foster Associates, Inc. for the EPA project 'A Statistical Study of Coal Sulfur Variability and Related Factors.' Its content and scope are designed to convey basic and necessary information about the data base and the computer program to permit data processing personnel to perform modifications and improvements to satisfy specific needs.

24936 **(PB—81-113003) Addendum to: 'environmental assessment: source test and evaluation report--Chapman low-Btu gasification'. Final report Mar 79-Sep 80.** Lewis, D.S.; Page, G.C. (Radian Corp., Austin, TX (USA)). Nov 1980. Contract EPA-68-02-3137. 100p. NTIS, PC A05/MF A01.

The report contains detailed organic analysis data on six streams, trace element and organic data on the solid waste leachates, and trace element data on the feed coal, all of which were not included in the original report, (PB-249 940). Samples from six streams were analyzed to provide a detailed organic characterization of emissions and potential fugitive emissions form an operating Chapman low-Btu gasifer using Virginia bituminous coal. The streams were: coal feeder vent discharge, separator vent discharge, separator liquor, separator tar, gasifier ash, and cyclone dust. All streams except the ash and dust contained organic compound concentrations of concern to health when evaluated using SAM/IA methodology. Phenols in the separator vent discharges and liquor and fused polycyclics in the coal feeder vent discharge and the separator tar were of greatest concern. When compared to screening data, potential effects were lower, but relative ranking of streams was essentially unchanged. The ash and dust were subjected to leachate extraction tests using the RCRA method and deionized water. No organics were found in the leachates. Concentrations of trace elements in the RCRA and deionized water leachates were different, but were found to have low potential for causing adverse health or ecological effects.

24937 **(PB—81-113615) Environmental effects of western coal combustion. Part III. The water quality of Rosebud Creek, Montana. Final report.** Skogerboe, R.K.; Miller, M.M.; Dick, D.L.; Thurston, R.V.; Russo, R.C. (Montana State Univ., Bozeman (USA). Fisheries Bioassay Lab.). Jul 1980. 70p. NTIS, PC A04/MF A01.

The results of a study on Rosebud Creek, Montana, designed to assess the impacts on water quality of surface coal mining and/or coal combustion at Colstrip are summarized herein. A general degradation of water quality has been observed along the stream

course but direct impacts of groundwater from the mine areas have not been demonstrated. Influxes of arsenic, mercury, selenium, and polynuclear aromatic compounds during snowmelt periods have been linked by analyses of snow samples to their accumulation in snowfall via scavenging of the power plume and subsequent delivery to the stream via surface runoff. Although this contaminant transfer route may prove highly significant, it is emphasized that this will depend on site specific conditions.

24938 **(PB—81-113664) High-temperature high-pressure particulate removal in coal gasification. Final report 1 Sep 78-1 Jan 80.** Rush, W.F. Jr; Onischak, M. (Institute of Gas Technology, Chicago, IL (USA)). Oct 1980. Contract GRI-5011-322-0083. 50p. NTIS, PC A03/MF A01.

IGT evaluated sonic agglomeration and crossflow filtration as techniques for removing fine particulates from high-temperature high-pressure gas streams. Preliminary cold-flow tests provided information about the feasibility of solid membrane crossflow filtration and sonic agglomeration to remove 1 to 10-micron particulates from dust-laden gas streams. Subsequent tests were conducted in high-temperature high-pressure equipment at operating conditions up to 265C (509F), and 7000 kPa (1999 psia). The tests showed that the solid membrane crossflow filtration removed at least 98% of the particulates from the 95% fraction of entering gas. Flow rate and membrane pressure differential data were obtained for the solid membrane cross-flow filter test unit of 2-micron pore size. Sonic agglomeration experiments in the cold-flow model used sound intensities and frequencies up to 145 dB and 3 to 13 kHz. These tests showed that particles below 10 microns grew in size. Experiments in an ambient-temperature and high-pressure apparatus showed that for the Hartmann whistle device used in these tests, the power output ad efficiency increased with system operating pressure. Analytical evaluations showed that the thermal flocculation technique requires thermal gradients of 10 to the 6th power C/cm to induce the particle collision necessary for flocculation.

24939 **(PB—81-113946) Chemically active fluid bed for SOX control. Volume I. process evaluation studies. Final report Jul 75-Oct 79.** Keairns, D.L.; Vaux, W.G.; Ulerich, N.H.; Vidt, E.J.; Newby, R.A. (Westinghouse Research and Development Center, Pittsburgh, PA (USA)). Dec 1979. Contract EPA-68-02-2142. 149p. NTIS, PC A07/MF A01.

The report describes selected process evaluation studies supporting the development of an atmospheric-pressure, fluidized-bed, chemically active gasification process, using a regenerative limestone sulfur sorbent to produce low- to intermediate-Btu fuel gas. Limestone sorbent selection and attrition, alternative metal oxide sorbents, particulate control, fuel supply, and an updated process assessment are investigated. Limestone sorbent selection results are presented for the EPA-sponsored CAFB demonstration plant. Sorbent attrition and economics are the main criteria as most limestone are not limited by sulfur removal. Trace element, regeneration, and disposal characteristics should be considered. Feasibility tests of air oxidation for disposal of gasifier solids for once-through operation show up to 70% conversion of the CaS. Methods for improving performance are identified. A procedure was developed to measure the attrition tendency of the sorbent selected. Brownwood limestone has intermediate attrition resistance showing 5.4% mass loss by attrition for this test, compared with three reference stones ranging from 0.5 to 9.1%. Sixteen alternative metal oxide sulfur sorbents that could reduce the environmental impact of solids disposal and may improve process economics were screened. CaO/CaO3, ZnO, and FeO are sorbents identified for further study.

24940 **(PB—81-114308) Pollutants from synthetic fuels production: environmental evaluation of coal gasification screening tests. Final report Aug 78-Jul 79.** Nichols, D.G.; Cleland, J.G.; Green, D.A.; Mixon, F.O.; Hughes, T.J. (Research Triangle Inst., Research Triangle Park, NC (USA)). Aug 1979. 152p. NTIS, PC A08/MF A01.

The report gives results of an environmental evaluation of 38 screening test runs using a laboratory-scale, fixed-bed coal gasifier to study pollutants generated during the gasification of various coals. Pollutants were identified and quantitative analyses performed for tars, aqueous condensates, volatile organics, primary gases, and reactor residues. Tar partition fractions were also generated and studied for each coal providing distributions of insolubles, organic acids and bases, polar and nonpolar neutrals, and polynuclear aromatic hydrocarbons. Showing the greatest potential for adverse health effects are: oxygen-containing species and PNAs in the tars and aqueous condensates; carbon monoxide, benzene, and hydrogen sulfide in the primary gas streams; and certain trace elements in the reactor residues. Bioassays of various coal gasification effluents showed the crude tars and selected tar fractions to have a potentially mutagenic character.

24941 **(PB—81-114555) Environmental impact assessment guidelines for new source coal gasification facilities. Interim report (final).** Rickles, R.N.; Whitenight, D.K. (Wapora, Inc., Washington, DC (USA)). Aug 1980. Contract EPA-68-01-4157. 108p. NTIS, PC A06/MF A01.

This report provides guidance for evaluating the environmental impacts of proposed new source coal gasification facilities. Because EPA has not yet issued new source performance standards for the coal gasification industry, the guidelines are published in interim final form. The guidelines are intended to assist in the identification of potential environmental impacts, and the information requirements for evaluating such impacts, in documents prepared under the National Environmental Policy Act. The report includes guidance on (1) identification of potential wastewater effluents, air emissions and solid wastes from coal gasification facilities, (2) assessment of the impacts of such residuals on the quality of the environment, (3) state-of-the-art technology for in-process and end-of-process control of waste streams, (4) evaluation of alternatives, and (5) environmental regulations that apply to industry. In addition, the guidelines include an 'overview' chapter that gives a general description of the coal gasification industry, significant problems associated with it, and recent trends in location, raw materials, processes, pollution control, and the demand for industry output.

24942 **(PB—81-115651) Analysis of the chemistry associated with ozonolysis of organic pollutant molecules in water.** Pringle, W. (Wesleyan Univ., Middletown, CT (USA)). 16 Sep 1980. 10p. NTIS, PC A02/MF A01.

This study sought to examine the chemistry and rates of chemical oxidation and to identify compounds residual from ozonation of organics identified in sewage treatment plant water. An all-glass system was constructed to ozonize aqueous solutions of trace organics, modified to contained quartz reaction cells for UV irradiation and to reduce sparging. Products and product yield rates were determined by instrumental analysis, including gas chromatography (GC), GC-mass spectrometry, pulsed Fourier transform nuclear magnetic resonance, and an assembled linear array photo-detector-computer system for laser-induced narrow-line low-temperature fluorescence spectra of trace organic concentrations. Toxic compounds studied for ozonation, oxidation products analysis, and reaction kinetics were phenol, the three chlorophenol isomers, dibenzofuran as a model for its toxic chlorinated analogs, and chloroform. Large differences were noted in the ozonolysis rates of the three chlorophenol isomers. It was also determinated that dibenzofuran ozonolysis was much faster in water than in organic solvents. Matrix isolation fluorescence was also examined as a trace technique for polycyclic aromatic hydrocarbons. It was sought to study ozonolysis to determine conditions for removal of toxic or suspect carcinogens resulting from chlorine treatment of sewage organics.

0120 Mining

REFER ALSO TO CITATION(S) 24934, 24968, 25070, 25635

24943 **(DOE/PC/30205—T1) Power shovel data accumulator and display.** (McDonnell Douglas Electronics Co., St. Charles, MO (USA)). Apr 1981. Contract AC22-80PC30205. 42p. NTIS, PC A03/MF A01.

In recent years the size of loading shovels has increased. Shovels with twenty to twenty five cubic yard overburden dippers are common and shovels with dipper capacities of over thirty yards are being introduced. Because of the expanding role of loading shovels in coal mining the Department of Energy sponsored the Power Shovel - Data Accumulator and Display program. The goal of this program is to develop a Data Accumulator and Display

System (DADS) to improve shovel utilization. The DADS is a computer-based information system that will continually monitor shovel operation, display performance parameters to the operator and provide mine management with a data base and reporting system on shovel production and maintenance. This system will become an integral part of new mine management technology that will allow better quantitative analysis of the mining operation in order to isolate and identify operational and maintenance problems. The DADS contract consists of three tasks: systems engineering, systems implementation and analysis of experimental data. The systems engineering task has been completed. The major items accomplished in this task were the definition of the hardware and operation of the DADS system and selecting a mining company to demonstrate DADS. A major obstacle in adapting sophisticated electronic systems to the mining industry has been the harsh mining environment. Applications in the mining industry demand military grade components at commercial prices. Task I has produced a cost-effective, modular hardware design with the reliability and capability to be used not only on DADS but in other future applications in the mining industry. This was accomplished by using high grade industrial components and packaging assemblies to meet environmental requirements.

24944 **Demonstration project for methane recovery from deep coal seams.** Coates, R.L. San Mateo, CA; Pacific Coast Gas Association (1980). 21p. (CONF-8003142—2).

From Pacific Coast Gas Association operating section transmission conference; Salt Lake City, UT, USA (31 Mar 1980).

This paper describes progress to date on a project begun early in 1979 under a cooperative agreement with the US Department of Energy. Two wells have been drilled into the coal seams of the Book Cliffs field approximately 16 miles north of Wellington, Utah. The coal at these locations is at a depth of 2700 to 3100 feet. Core samples from two principal seams were obtained, these seams being the 7-foot thick Sunnyside seam and the 13-foot thick Gilson seam. The core samples were placed in gas collection containers and the gas desorbed was monitored over a 4-month period. The volume of gas desorbed, which was 95 to 99 percent methane, ranged from 169 to 414 standard cubic feet per ton of coal. Tests made of water production from the coal seams and adjacent strata indicate rates of 100 to 200 barrels per day are to be expected. Water pumping equipment is presently being installed. The measurements of the gas content together with permeability measurements and computer model calculations indicate gas production rates of 50 to 250 MCFD might be expected.

0130 Transport And Handling

REFER ALSO TO CITATION(S) 24852, 25381

24945 **(ANL/EES-TM—139) Issues associated with coal-slurry-pipeline development.** Tobin, R.L.; Johnson, L.R.; Luner, V.A.; Wallingford, P.; Rogozen, M. (Argonne National Lab., IL (USA)). Dec 1980. Contract W-31-109-ENG-38. 84p. NTIS, PC A05/MF A01.

Coal-slurry pipelines have been proposed as a means to meet increasing requirements for coal transportation. Issues associated with the use of coal-slurry pipelines are analyzed in this report. The major topics discussed are: eminent domain for coal-slurry pipelines; water availability, both legal and physical, for coal slurry; and environmental impacts of construction and operation of coal-slurry pipelines. Currently proposed coal-slurry pipelines are described and examined in light of these issues.

24946 **(CONF-810607—8) Transient modeling of froth flotation and vacuum filtration processes.** Brown, C.H. Jr.; Allgood, G.O.; Canright, G.S.; Hamel, W.R. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01.

From Symposium on instrumentation and control for fossil energy processes; San Francisco, CA, USA (8 Jun 1981).

Transient models of the froth flotation and vacuum filtration processes as applied to fine-coal beneficiation are presented. The models consist of sets of simultaneous ordinary differential and algebraic equations which were derived based on the principles of conservation of mass. The froth flotation process model was developed by drawing the analogy between a single flotation stage and a continuous stirred-tank reactor. Flotation kinetics were described by a model that is first order in displacement of solids concentration from equilibrium. The kinetic parameters were obtained by analysis of published experimental data. The vacuum disc filter model was developed by subdividing the filtration cycle into filtration, drying, and blowoff. The filtration and drying portions of the operating cycle were described by classical representations of these two unit processes. Equations that describe the filter vat dynamics are also presented, thus completing the mathematical representation of filtration.

24947 **(CONF-810607—10) Dynamic simulation of the coal froth flotation and filtration processes.** Canright, G.S.; Allgood, G.O.; Brown, C.H. Jr.; Hamel, W.R. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01. Order Number DE81023191.

From Symposium on instrumentation and control for fossil energy processes; San Francisco, CA, USA (8 Jun 1981).

A digital computer simulation is presented for two unit operations from the fine-coal circuit of coal preparation plants. Transient mathematical models of the flotation process and the fine-coal filter were the basis for the simulation, which was carried out using the IBM Continuous System Modeling Program (CSMP). Control strategies representative of those currently in use, as well as a proposed automatic control, were modeled and applied to each unit. The fine-coal filter performance was expressed in terms of cake moisture content at discharge. Performance of the flotation unit was quantified in terms of overproduct ash content and salable coal lost to the tailings. A standard feed disturbance was input to the flotation process and carried through the overflow to the filter. Performance of the various control schemes was compared according to the above criteria. The two fltration controls showed no significant difference in performance; however, the flotation results gave a definite ranking of the three control strategies. A simple economic analysis (payout period) was performed for the two flotation control alternatives that yielded the best performance. The analysis indicated that substantial savings could be realized by the automatic control of froth flotation.

24948 **(IS-M—311) Analysis of dielectric heating and conductive cooling of pyrite in coal.** Bluhm, D.D.; Fanslow, G.E.; Nelson, S.O. (Ames Lab., IA (USA); Georgia Univ., Athens (USA). Agricultural Research Center). 1981. Contract W-7405-ENG-82. 4p. (CONF-810677—1). NTIS, PC A02/MF A01. Order Number DE81023786.

From International microwave power symposium; Toronto, Canada (9 Jun 1981).

Electrical and thermal properties of pyrite and coal were used to obtain a theoretical analysis of dielectric heating and conductive cooling of pyrite in coal. The results were used to establish radiation levels required to produce pyrite-coal temperature differentials in solid coals. The objective of dielectric heating of pyrite in coal is to raise its temperature to a point where its magnetic susceptibility will be enhanced. This will improve the possibility of removal of the pyrite from the coal by magnetic separation methods and it will reduce the coals potential for producing pollution by lowering its sulfur content. The purpose in using dielectric heating is to attempt to heat the pyrite without wasting energy by also heating the coal. This paper provides information on the levels of radiation required to produce this selective heating of pyrite in coal and it uses this information to assess the practicality of this approach to cleaning coal. Although the calculations appear to obviate the practicality of the magnetic enhancement of pyrite in coal by selective dielectric heating, there is some experimental evidence, using pulverized coals, where magnetic enhancement was produced at lower transmitted power levels. The magnetized particles are being analyzed to ascertain their identities.

24949 **Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion.** Houston, TX; Coal Technology '80 Conference (1980). 716p. (CONF-801142—(Vols.3and4)). Coal Technology '80 Conference, 6006 Bellaire Boulevard, Suite 100, Houston, TX 77081.

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

The 3rd international coal utilization exhibition and conference was held at the Astrohall, Houston, Texas, November 18-20, 1980. Thirty-two papers have been entered individually into EDB and two also into ERA. Vol. 3 covers storage and handling, coal preparation, dusts and fire protection and sampling. Volume 4 covers combustion (nitrogen oxide emissions, effects of alkalia on fouling and slugging), boiler design, pulverizers, particulate control with electrostatic precipitators and baghouses, flue gas desulfurization and disposal of fly ash ashes and sludges. (LTN)

24950 (PB—81-109688) Development of a standardized US flag dry-bulk carrier (phase II). steam coal trade projections. Final report. (Rosenblatt (M.) and Son, Inc., New York (USA)). Aug 1980. Contract MA-7-38053. 84p. NTIS, PC A05/MF A01.

In the light of recent energy developments and world trade in stream coal, this publication essentially amplifies Appendix A of the study entitled Development of a U.S. Flag Standardized Dry Bulk Carrier which considered only metallurgical coal. The report states that seaborne coal, although 50 million tons/year is still very much in its infancy.

24951 (PB—81-110868) Financial aspects of coal transportation by rail. Final report Oct 78-Sep 79. Coleman, R.C.; Knoblauch, K. (Input Output Computer Services, Inc., Washington, DC (USA)). 18 Sep 1979. Contract DOT-OS-80083. 125p. NTIS, PC A06/MF A01.

The report evaluates both the financial capability of this country's railroads to invest in incremental coal-carrying capacity and the rates of return allowed on these incremental investments. Given coal movements scenarios are utilized to estimate incremental coal movements by railroad and investment requirements to handle these movements are determined. The financial resources of the railroads are analyzed and capital acquisition strategies are assessed and selected. Railroads are segregated by financial status and the various financial markets are examined to determine cost and availability of capital. A description of various debt and equity issues is included. Various rate-making methodologies are examined with regard to their treatment of return on investment. Utilizing the costs of capital determined above and the return on capital costs allowed by these rate methodologies, the effects on the financial viability of the railroads is analyzed.

24952 (PB—81-113953) Cost benefits associated with the use of physically cleaned coal. Final report May 78-Nov 79. Isa cs, G.A.; Ressl, R.A.; Spaite, P.W. (PEDCo Environmental, Inc., Dallas, TX (USA)). May 1980. Contract EPA-68-02-2603. 127p. NTIS, PC A07/MF A01.

The report identifies and quantifies several benefits associated with the use of physically cleaned coal in the operation of utility electric power plants. The benefits occur in: coal and ash handling, boiler operation, and gas handling and cleaning. Cleaning removes sulfur from the coal, thus reducing the emission of SO2 into the atmosphere. In most cases, however, the power plant must install supplemental control equipment to reduce emissions enough for compliance with environmental regulations. The cost of this supplemental equipment is less than the cost of a control system for use with uncleaned coal, but the cost decrement is usually insufficient to offset coal cleaning costs. Typically, however, the total of all benefits addressed in the report exceeds the cost of cleaning the coal. In a typical case, the cost of coal cleaning is $4.85 per ton of cleaned coal; whereas, total benefits associated with cleaning the coal are $7.20 per ton of cleaned coal. The report recommends additional projects aimed at quantifying coal cleaning benefits, and presents an annotated bibliography of related studies.

24953 Applications of polymer extrusion technology to coal processing. Lewis, D.W. (Jet Propulsion Lab., Pasadena, CA). pp 125-137 of Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space. Azusa, CA; Society for the Advancement of Material and Process Engineering (1981).

From SAMPE symposium/exhibition; Los Angeles, CA, USA (28 Apr 1981).

Large deposits of high-volatile bituminous coals exhibit an intriguing plastic property when heated to a temperature in the range of 780 to 900°F (416 to 482°C). Renewed research interest in the plastic state of coal has resulted in several innovative energy applications but development has been blocked by an inability to control the continuous processing of large quantities of plastic coal. Experiments at the Jet Propulsion Laboratory and its contractors have shown that instabilities occur with large sincle-screw extruders but are avoided when an intermeshing twin-screw extruder is used. Also discussed is how the release of volatiles from the hot coal have contributed to the unstable operations in the single-screw extruder and how this is a significant complication when compared to the extrusion of polymers. The improved mixing achieved by the intermeshing screws of the twin extruder is sufficient to result in a steady controlled process.

24954 Evaluation of chemical coal cleaning processes. Huettenhain, H.; Ruby, J.D.; Yim, Y.J.; Taylor, S.R. pp 207-244 of Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

Conceptual designs and economic evaluations of several chemical coal cleaning processes were prepared under contract to the Department of Energy. Conceptual designs were based on criteria from process developers. The following chemical cleaning processes were investigated: The Pittsburgh Energy Technology Center process, the Ledgemont process (one of several developed by Ledgemont), the Ames Laboratory process, the Jet Propulsion Laboratory process, and the Guth process (formerly known as the KVB process). Conceptual designs were also prepared for physical cleaning and grinding operations prior to the chemical treatment. Capital, operating and maintenance, and discounted-cash-flow cleaning costs were estimated. Based on the economic/financial criteria used in the study, cleaning costs ranged from $36 to $48 per ton of clean coal. Major conclusions formed during the study include the following: All of the chemical coal cleaning processes appear technically feasible. Their economic feasibility is less certain. Industrial boilers for direct combustion and special products such as coal-oil mixtures appear to be the main potential markets for chemically cleaned coals. Electric utility demand for chemically cleaned coal is unlikely in view of the cost and existing environmental regulations. Handling, storage, and transportation of fine coal from chemical treatment plants will add to fuel costs.

0140 Combustion

REFER ALSO TO CITATION(S) 24949, 25436, 25444, 25445, 25447

24955 (CONF-800806—44) Methods of improving limestone utilization in FBC. Smyk, E.B.; Swift, W.M.; Podolski, W.F.; Myles, K.M.; Johnson, I. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 15p. NTIS, PC A02/MF A01. Order Number DE81023123.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

Increasing the calcium utilization of spent limestone from 20 to 50% in a typical 600-MW AFBC would eliminate the need to quarry and transport approximately 500,000 tons per year of fresh limestone, would decrease waste production by a corresponding amount, and would save a total of approximately $6,000,000 per year in direct costs. The techniques that have been proposed to improve limestone utilization can be divided into three broad categories: (1) pre-sulfation treatment, (2) modification of sulfation parameters, and (3) post-sulfation treatment to allow reuse of the limestone. Pre-sulfation treatments include both heat treatment (pre-calcination) of the limestone and addition of small quantities (0.5 to 2.0%) of various salts to the limestone. Both of these methods alter the pore structure of the limestone so that more of the calcium is accessible for sulfation. Operational parameters having significant effects on limestone utilization are gas residence time, limestone particle size, and bed temperature. Gas residence time can be increased (for increased limestone utilization) by utilizing deeper beds or lower superficial gas velocities. Also, decreasing the limestone particle size generally increases limestone reactivity but also results in more elutriation. Elutriated particles must then be captured in downstream cyclones and recycled to the bed in order to improve

limestone utilization. Post-sulfation treatments to allow the reuse of limestone include (1) grinding and subsequent pelletizing, (2) hydration, and (3) regeneration. These methods are compared as to their mechanisms, effectiveness, difficulty of scale-up, potential side effects, retrofit potential, possible problems with materials of construction, energy efficiency, and cost.

24956 **(CONF-800806—45) Hydration of spent limestone and dolomite to enhance sulfation in fluidized-bed combustion.** Shearer, J.A.; Smith, G.W.; Moulton, D.S.; Turner, C.B.; Myles, K.M.; Johnson, I. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 13p. NTIS, PC A02/MF A01. Order Number DE81023124.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

The utilization of CaO in fluidized bed combustion can be markedly increased to reduce the cost and environmental impact of quarrying and disposing of large quantities of solid waste. A new method of treatment of spent bed material to reactivate its SO_2 capturing ability has been found. Partially sulfated spent overflow material from a fluidized-bed combustor is treated with water and then reintroduced to the combustor as renewed feed that further reacts with SO_2. This material has sufficient physical integrity, due to the outer layer of $CaSO_4$, and high reactivity to make it suitable as a sorbent feedstock. The work reported here details observations on a number of limestones and dolomites reacted in laboratory furnaces under simulated combustion conditions as well as verification of the effectiveness of the method in a 15-cm-ID process development unit scale atmospheric fluidized-bed coal combustor. Initial kinetic studies have also been made on the hydration reaction of partially sulfated limestone. A proposed mechanism of interaction is discussed to explain the enhanced reactivity. Changes in total porosity and pore size distribution in the partially sulfated material due to $Ca(OH)_2$ formation and its dehydration serve to open up the particle interior and its residual CaO to further reaction with SO_2. Almost complete utilization of the available CaO can be achieved by successive applications of this promising new technique.

24957 **(DOE/FC/02030—T1) Lignite combustion test project summary report. Test L-115.** (Combustion Power Co., Inc., Menlo Park, CA (USA)). Jun 1981. Contract AC18-78FC02030. 39p. NTIS, PC A03/MF A01.

Fluidized bed combustion research on North Dakota lignite is being performed by Combustion Power Company, Inc., under contract to Grand Forks Energy Technology Center. Modification A001 expanded the original Statement of Work by new tasks, one of which was to conduct a 250-h test on Beulah, North Dakota lignite and analyze the data (L115). This report summarizes the experimental results of Test L115. In-depth analysis of the data and correlation with Tests L101-L114 will be included in the final report.

24958 **(EPRI-WS—80-127) Applications of fireside additives to utility boilers: workshop proceedings.** Lansing, N.F. (ed.). (Battelle Columbus Labs., OH (USA)). May 1981. 191p. (CONF-8008117—). NTIS, PC A09/MF A01. Order Number DE81903488.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

On August 3 and 4, 1980, EPRI held a workshop in Boston, Massachusetts, on the use of fireside additives to remedy problems of fossil-fuel-fired utility boilers: corrosion, fouling, superheat control, acidic emissions, and fly ash control. Changing conditions of fueling, regulation, and operation are continuing to increase the complexity of these problems. The dual purpose of the workshop was to focus the current knowledge and experience in this broad area and to define issues that need to be further addressed. The impetus for the workshop was provided by recent surveys performed by Battelle, Columbus Laboratories, and sponsored by EPRI with the assistance of the Edison Electric Institute Prime Movers Committee. Their findings are reported in EPRI Final Report CS-1318, Electric Utility Use of Fireside Additives, which includes guidelines for additive selection and for planning additive trials. The following general conclusions were reached by the discussion groups: (1) for oil firing - MgO in an oil dispersion is the additive most effective in combating corrosion from vanadium and sulfur trioxide; many other additives are useful depending on circumstances; additive performance is site specific (experience in one boiler is not directly transferable to another); and there are many unanswered questions regarding additive use, including the most effective test-program procedures. (2) For coal firing - the use of additives developed for oil firing has been helpful in some cases, but is neither optimum nor sufficient for all cases; and better data are needed on a range of problems and applications including slag behavior, deposit effects, corrosion suppression, plume-visibility reduction, and coal handling. Seventeen papers have been entered individually into EDB and ERA. (LTN)

24959 (EPRI-WS—80-127, pp 1.1-1.18) **Overview of EPRI survey on fireside additives: excerpts from survey report.** Locklin, D.W. (Battelle Columbus Labs., OH). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

Fireside additives have been used or proposed for fossil-fuel-fired utility boilers to combat a number of problems related to boiler performance and reliability - including corrosion, fouling, superheat control, and acidic emissions. Fuel additives and other fireside additives have been used mainly with oil firing. However, there is growing experience with additives in coal firing, especially for fly-ash conditioning to improve the performance of electrostatic precipitators. It was the intent of the project to present a fair and comprehensive evaluation of the use of generic classes of additives, but not to take an advocacy position, nor to recommend any specific additive or vendor. Such decisions will rest with individual utilities. The report describes the combined results of a state-of-the-art review of technical literature and a special survey of utility experience. Thirty-eight utilities participated in the survey, and provided information on trials conducted on 104 units in 93 different plants. In all, 445 separate trials were reported, each representing a unit/additive/fuel combination. Additives used in these trials included 90 different additive formulations, including both pure compounds and proprietary products. These formulations were categorized into 37 generic classes according to their chemical constituents. The results of the survey are presented by these generic classes. The report is organized according to the operating problems for which fireside additives are used, and includes guidelines for utility use to select additives and to plan additive trials.

24960 (EPRI-WS—80-127, pp 1.33-1.41) **Use of fuel additives in coal firing.** Anson, D. (Battelle Columbus Labs., OH). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

The review deals successively with each of the three main combustion systems: stokers, cyclones, and pulverized-coal firing systems. This approach reflects differences among the problems found in these systems, and helps to focus on the plant types of most interest. The problems characteristic of stoker-fired units are: low efficiency of combustion caused by carryover of unburned solids and tars; the formation of clinker on the grates; and deposits on convective heat-transfer surfaces. Stoker-fired units were the subject of early attempts to improve combustion efficiency by catalytically active or chemically active additives. Large dose rates were required (over 1% of the coal input), but only minor effects were noted. Mainly, these were enhanced combustion of deposits on boiler surfaces. Cyclone-fired units, and other wet bottom furnaces, depend on the use of coals that produce fusible slags of moderate viscosity at the operating temperature. Additives have been used successfully to improve slag properties in all kinds of slag-tap furnaces. In addition, magnesia-based additives have been used successfully in at least one case to reduce acid corrosion by condensed sulfuric acid formed from SO_3 in a cyclone boiler. The main concerns in pulverized-coal-fired units (the type used most commonly) are: furnace slagging, convective-pass fouling, high-temperature-tube corrosion, and low-temperature corrosion. The foregoing discussion on slag fusion behavior suggests that furnace slagging cannot easily be reduced by using additives. Small additions are likely to reduce the slag melting point and thus increase the tendency to slagging. Large additions are economically unattractive and likely to aggravate other problems. An exceptional case is recorded in the report. The addition of lime to a lime-rich coal moved the composition further from the eutectic point. This effect may be of increasing importance as certain western coals come into prominence.

24961 (EPRI-WS—80-127, pp 2.37-2.58) **Planning and executing fireside additive testing in Ontario Hydro.** Dooley, R.B.; Chacinski, V. (Ontario Hydro, Toronto). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

Some of the critical parameters considered during the planning and execution of fireside additive trials are discussed. Trials have been undertaken at Ontario Hydro to determine high-temperature deposition in superheaters and reheaters and also to determine low-temperature deposition and corrosiveness in air heaters and on duct work. Both regions are discussed by reference to trials conducted on 500 MWe oil-fired units. Tests such as those described and the required subsequent analysis are very time-consuming and costly. Often the units must be operated out of merit to encompass the test period at controlled conditions. However, the planning and thought given to the critical operating answers which were required at the end of the tests made it possible to perform a minimum number of tests. As Ontario Hydro was entering essentially a new era of back-end additions, it was considered that the costs of obtaining good quantitative data initially would be much less than the costs that might result from adopting incorrect additive rates which could result later in serious operating problems.

24962 (EPRI-WS—80-127, pp 3.1-3.15) **Effects of a volatile fireside manganese additive on coal-fired utility boiler operation.** Gray, M. (American Electric Power Service Corp., Canton, OH). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

Significant performance benefits were obtained with no adverse effects when a volatile organometallic manganese additive - methyl cyclopentadienyl manganese tricarbonyl (manganese MMT) - was added to the coal-air mixture firing a 525-MWe supercritical cyclone boiler at the rate of 20 g/ton (0.044 lb/ton) coal. The addition of manganese MMT eliminated acid particulate fallout and reduced both pluggage and corrosion of the air preheater as well as slagging in the convective pass and upper primary furnace. This paper describes the test details and operational experience.

24963 (EPRI-WS—80-127, pp 3.44-3.51) **Summary of discussion-group sessions on use of additives in coal-fired plants.** Anson, D. (Battelle Columbus Labs., OH). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

Use of additives developed for oil-firing applications has given some encouraging results, but such additives are not necessarily the best for coal firing, and they do not meet all coal-firing needs. The discussions were useful for defining the following needs: guidelines to assist the prediction of required dose rates of boron-based additives to reduce slag viscosity; extension of data on slag behavior to cover new coal sources; better understanding of the potential for additives to modify coal-ash deposits on high-temperature surfaces; reliable laboratory tests to predict the tendency of ash (with and without additives) to form bonded deposits; data on the possible suppression of high-temperature corrosion by additives; guidance on the selection of additives and dose rates of additives to control low-temperature corrosion in coal-fired units; information on the plugging tendency of corrosion-control additives; information on additives to reduce air-heater plugging; guidance on the selection of additives to reduce plume visibility - ammonia may fill this role, in which case the need is for guidance on dose rate and handling; and development of improved routines to treat coal at the mine to prevent loss of fines during transit and to improve coal flow at the power plant.

24964 **(ORNL/TM—7292) Physicochemical characterizations of limestone for fluidized-bed coal combustion.** Fuller, E.L. Jr.; Yoos, T.R. III; Walia, D.S. (Oak Ridge National Lab., TN (USA)). May 1981. Contract W-7405-ENG-26. 101p. NTIS, PC A06/MF A01.

This study is an investigation of the physicochemical characteristics of three limestone samples, Quincy limestone (-20 + 60), Franklin limestone (-12 + 30), and Franklin limestone (-6 + 16), currently being tested at Oak Ridge National Laboratory for use in a fluidized-bed coal combustion unit. By correlating the chemistry, mineralogy, and surface area of these samples with empirical data obtained at Argonne National Laboratory, the sulfur capture ability and performance of these limestones can be loosely predicted. X-ray fluorescence and neutron activation analysis revealed a very high calcium content and very low concentrations of other elements in the three samples. X-ray diffraction patterns and petrographic examination of the limestone grains detected essentially no dolomite in the Quincy limestone or the fine Franklin limestone samples. The coarse Franklin limestone sample showed dolomite to be present in varying amounts up to maximum of 2.75%. Limited surface chemistry investigations of the samples were undertaken. Limestone and dolostone resources of the Tennessee Valley Authority region are widespread and abundant, and judged sufficient to meet industrial demand for many years. No problems are anticipated in securing limestone or dolostone supplies for a commercial fluidized-bed combustion plant in the Tennessee Valley Authority region. Transportation facilities and costs for limestone or dolostone will influence the siting of such a commercial fluidized-bed combustion plant. The most promising location in the Tennessee Valley Authority region at this time is Paducah, Kentucky.

24965 **Direct firing of coal-water suspensions: state-of-the-art review.** Marnell, P. (Brookhaven National Lab., Upton, NY). pp 485-499 of Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

DOE is actively involved in the development of coal-water handling and combustion technology. In addition to the preceding Atlantic Research Corporation work, they have funded Brookhaven National Laboratory (BNL) to assist in the preparation of a comprehensive, integrated plan for a government sponsored research and development program in coal-water combustion and handling. The resulting program can be integrated with existing DOE programs in coal cleaning and preparation in order to achieve the desired goal of a clean, finely pulverized coal-water suspension which could be utilized in a large number of existing combustors and the vast majority of new combustors. In order to develop a program with an absolute minimum of duplication of prior work, BNL is conducting an exhaustive review of past and current work in coal-water handling and combustion. Coal-water combustion technology has been successfully demonstrated on a commercial scale in at least four installations, and headway has been made in describing and understanding the basic phenomena that occur during the combustion of a coal-water suspension. The handling and storage characteristics of coal-water suspensions are generally known, though engineering correlations for US coals, ground to, say, dry pulverized coal firing specifications, have not appeared in the literature. The refinement of the technology and its optimization and a deeper understanding of the various aspects of the combustion process will require further effort.

24966 **Potential of colloidal fuels in future energy usage.** Oxley, J.H. (Battelle Columbus Labs., OH); Blase, E.F. pp 521-544 of Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

Pulverized coal has been an increasing important source of energy over the past century. Most large utility boilers, all modern coking plants, and many industrial boilers and blast furnaces employ pulverized coal as a major feed stream. In periods of oil shortages, such as during World Wars I and II, the concept of adding powdered coal to oil for use in combustion equipment originally designed for oil has been actively persued but rarely used. Over this same period of time, there have been attempts to use air suspensions of coal dust in diesel engines in Germany, and in turbines in various countries. Most recently the use of water as the suspending fluid has been the subject of study. The economic advantages to be enjoyed by substitution of powdered coal for oil are not generally realized. Oil costs at $30/bbl represent a fuel value of about $5.00/$10^6$ Btu; coal at $25/ton is equivalent to approximately $1.00/$10^6$ Btu. Although capital costs for the use of coal are higher than those associated with the use of oil, coal is clearly becoming

the least costly fuel. It was, therefore, recommended that increased national attention be given to develop these finer grinds of carbonaceous fuels to be used in various suspending fluids. The major disadvantages of this technology concern the increased environmental control problems with the use of coal in colloidal form. These problems arise because of the high levels of noncarbonaceous material in coal, because finely divided coal itself is at least generally considered unsightly, it may be a significant health problem when inhaled, and because coal dust is highly combustible and even explosive under the appropriate conditions.

24967 **Circulating fluidized bed boiler.** Fraley, L.D.; Do, L.N.; Hsiao, K.H. (Pullman Kellogg Co., Houston, TX). pp 715-722 of Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

The circulating bed combustor represents an alternative concept of burning coal in fluidized bed technology, which offers distinct advantages over both the current conventional fluidized bed combustion system and the pulverized coal boilers equipped with flue gas desulfurization. This paper presents the conceptual design of a circulating fluidized bed coal combustor to be used as a steam generator for a power plant. The design variables are selected to optimize the combustor's performance, size and cost. Some advantages of the combustor include good turndown capabilities, high throughput and simplified feeding. The main problem area is in the capacity of cyclones which separate the circulating bed solids from the flue gas. Guidelines for additional development work are recommended. This paper presents a conceptual design of this circulating bed combustor used as steam generator for a 525 MWe power plant. The circulating bed boiler (CBB) will be evaluated by comparing the performance of the CBB plant to a conventional pulverized coal boiler plant.

0150 Marketing And Economics

24968 **Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation.** Houston, TX; Coal Technology '80 Conference (1980). 377p. (CONF-801142—(Vols.1and2)). Coal Technology '80 Conference, 6006 Bellaire Blvd., Suite 100, Houston, TX, 77081.

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

The Third International Coal Utilization Exhibition and Conference was held at the Astrohall, Houston, Texas, Nov. 18-20, 1980. The papers in Vol. 1 and 2 deal with a projection of coal's role in filling global energy needs in the next 25 years, the financial requirements for this and for synthetic fuels plants, US legislation involving energy and environmental issues, and several papers on coal transport (by barge, rail or slurry pipelines) with emphasis on unit trains and train-barge combinations. Twenty-two papers have been entered individually into EDB, two in ERA, and three into EAPA. (LTN)

24969 **(DOE/RG/10446—T1) Analysis of alternative-fuel price trajectories.** (Decision Analysis Corp., Annandale, VA (USA)). 31 Dec 1980. Contract AC01-80RG10446. 84p. NTIS, PC A05/MF A01.

Findings are presented from a study to (1) acquire, analyze, and report alternative published price projections including both oil- and coal-price trajectories, and to (2) apply the fixed-annuity formula to the updated primary source projections (Energy Information Administration; Data Resources, Inc.; and Wharton Econometric Forecasting Associates, Inc.) and to the newly acquired price projections. This report also encompasses: comparisons of key assumptions underlying the price projections, and a discussion of the applicability of the fixed-annuity formula as used in the alternative-cost calculation. Section II contains graphic presentations of all updated and newly acquired coal and oil price forecasts and the corresponding calculated annuity equivalents, tabulated presentations and discussions of each forecast and underlying assumptions, and a description of how each forecast price series was transformed into input for the present-value formulas. Section III presents the fixed-annuity formula employed and discusses its appropriateness for this application. Section IV discusses the applicability of the net present value approach for comparing alternate-fuel price trajectories. Appendix A contains a listing of contacts as potential sources of price forecasts. Appendix B contains the raw forecast data from each forecast source and the coal and oil price series derived from the raw data which were actually input into the cost calculation procedure. Appendix C contains a description and listing of the computer program developed to implement the cost calculation procedure. Finally, Appendix D contains tabulations and discussions of other alternative world crude price forecasts that were identified, but for which no corresponding coal-price projections were available. (MCW)

24970 **Synfuels challenges and opportunities.** Bowden, J.R. (Conoco Coal Development Co., Library, PA). pp 33-50 of Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

In his 1979 energy message, President Carter stressed the need to reach a target of 500,000 bpd of synthetic fuels by 1987 and 2 million bpd by 1990. The requirements of coal and of processing plants to meet this target are considered with special attention to the long lead-time and capital requirements. The present status of the program involves four direct liquefaction projects and four coal gasification projects (pilot and demonstration plants with US DOE support). The gasification part may be more important than the liquefaction part because a liquefaction plant must have a major gasification section (1/3 of the total) and gasification is needed to produce fuel gas and to make liquefaction products indirectly. The need for broad, bold, intelligent business/government cooperation toward mutually agreeable energy programs is vital and necessary more than ever today as our nation faces one of the greatest energy challenges in its history. Without decisive cooperation and positive, open communications on all fronts there is the increasing danger of confusion and misunderstanding resulting in unnecessary delay and disruption of our national goals. Unless we adopt tax or financial incentive policies which make synthetic fuel plants an attractive proposition, broad-based production will be impossible. There is a need for a national commitment to synthetic fuels similar to what has occurred in South Africa and Canada. The creation of a synthetic fuel industry will have a positive, beneficial effect on the whole US economy. (LTN)

0160 Health And Safety

REFER ALSO TO CITATION(S) 26094

24971 **(CONF-810652—5) Energy analysis of the coal fuel cycle: community health and resource change in an Appalachian coal county.** Watson, A.P. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01. Order Number DE81024123.

From International symposium on health impacts of different sources of energy; Nashville, TN, USA (22 Jun 1981).

In spite of steadily expanding US coal development in this decade, there has been little systematic assessment of occupational and public health implications of increased production in specific regions of the United States. Preliminary analysis of a prototype Applachian area is presented. Anderson County, Tennessee, the prototype area chosen for evaluation, lies in the Upper East Tennessee Coalfield. This county is uniquely studied for study since every process of the coal fuel cycle (extraction, transport, combustion, power production, and waste disposal) takes place within the county boundary. By extensive exploitation of both surface and underground methods of extraction, this county has maintained a leading position in Tennessee's coal production for several years. Concepts of energy analysis and systematized data presentation were used to convert information gathered from diverse sources into comparable energy units (kcal). Concepts and methodology implemented in the analysis can be applied most appropriately to existing conditions in other counties of the Appalachian Coal Basin. Findings are presented for calendar year 1978. For the year of study, the major energy loss to the county was depletion of the coal resource base by use of inefficient mining techniques (a loss of 10.5 x

10^{12} kcal fuel equivalents). Another loss is to community health, which is depleted by lost productivity of, and compensation payments to, victims of mining accidents and occupational disease such as black lung (15 x 10^9 kcal). Another county wide depletion process is roadbed and bridge deterioration caused by large volumes of heavy, coal-haul vehicular traffic (10 x 10^9 kcal). These losses are being largely borne by residents of the Appalachian host region with little systematic compensation by consumers of the coal resource. It is expected that these losses will increase in magnitude as national coal use expands.

0170 Legislation And Regulations

REFER ALSO TO CITATION(S) 24933, 24970, 25636, 25840

02 PETROLEUM

REFER ALSO TO CITATION(S) 26717

0201 Reserves

REFER ALSO TO CITATION(S) 24976

0202 Geology And Exploration

24972 (DOE/BETC/IC—80/3(Vol.1), pp 2p, Paper 10) **Cross-borehole seismic probing for petroleum reservoir assessment.** Okada, J.T. (Lawrence Livermore National Lab., CA). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

Lawrence Livermore National Laboratory is conducting an experimental effort to ascertain the feasibility and cost of determining reservoir parameters in a two-dimensional region bounded by a well pair. The diagnostic elements which will be used to estimate the reservoir parameters are the acoustic velocity and attenuation of the reservoir constituents. The first year's efforts have consisted of specifying and testing the acoustic equipment and locating and obtaining use of an oil reservoir site.

24973 **Estimating undiscovered oil resources: an engineering approach.** Uri, N.D. (US DOE). *Energy Sources (New York)*; 5: No. 3, 197-209(1980).

This paper is an evaluation of the earlier work of M.K. Hubbert. Its purpose is to estimate objectively the total recoverable (that is, producible) oil in the United States and in Nigeria. The results, based on an engineering model, indicate that 198 billion barrels are ultimately recoverable in the United States, of which 113.8 billion barrels were produced through 1977. For Nigeria, 19.4 billion barrels are ultimately recoverable, of which 6.1 billion barrels were produced at the end of 1977. 9 refs.

0203 Drilling And Production

REFER ALSO TO CITATION(S) 25040, 25047, 25053, 25059, 26019, 26404

24974 **(DOE/BC/20001—10) Tertiary oil recovery processes research at the University of Texas. Final report, October 1979-September 1980.** Schechter, R.S.; Wade, W.H. (Texas Univ., Austin (USA). Dept. of Petroleum Engineering). Jun 1981. Contract AC19-79BC20001. 135p. NTIS, PC A07/MF A01. Order Number DE81025222.

During the past year the research continued to focus on surfactant adsorption, phase behavior, interfacial tension, and solubilization. This report is subdivided into two sections, the first dealing with adsorption and the second with the latter three areas mentioned above. During the past year we have focussed on solubilization, I.F.T., and phase behavior with the emphasis being on the influence of branching for anionics and molecular weight for nonionics. In addition we have (1) related phase behavior to emulsion stability, (2) continued studies on polymeric surfactants, and (3) continued our synthesis and evaluation program for a variety of salinity tolerant surfactants.

24975 **(DOE/BETC/IC—80/3(Vol.1)) Resource assessment. Annual report, October 1, 1979-September 30, 1980.** Linville, B. (ed.). (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). 1980. 331p. NTIS, PC A15/MF A01.

The Department of Energy is developing a computer-based catalog of properties of petroleum reservoirs to enable the continuous assessment of the country's resource for EOR applicability. The development of improved methods for determination of residual oil saturation is an important part of the assessment. Better diagnostic tools for characterizing the reservoir will improve the ability to predict the usefulness of EOR techniques. And as additional data on field experiments with EOR methods can be added to the data bank, both the development of criteria to select an EOR method and the predictability of its results will improve. This section of the Petroleum Research Report contains 3 papers on resource characterization, 15 papers on reservoir evaluation, 3 papers on environmental technology, 4 papers on improved drilling technology, 3 papers on extraction technology, and 2 papers on the tar sands.

24976 (DOE/BETC/IC—80/3(Vol.1), pp 7p, Paper 1) **Characterization of the domestic oil resource for enhanced oil recovery.** Collins, A.G.; Chism, J.E.; French, T.R.; Fletcher, G.E. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

This project is compiling a comprehensive, validated, integrated, computer processible, continuously maintained and updated data base containing information on all domestic oil resources (except tar sands). The data base will contain oil reserves, oil analyses, geologic analyses, engineering analyses, water reserves, water analyses, reservoir rock analyses, logging records and analyses, drilling analyses, EOR chemical data, EOR screening criteria, etc. These data will be used to calculate the total EOR resource and further to project the EOR potential for specific EOR techniques. Research related to EOR injection water compatibilities also was conducted. Studies of the effects that divalent ions have upon EOR chemicals were made. Also studies were made of the solubilities of strontium sulfate in saline waters at temperatures found in some oil reservoirs.

24977 (DOE/BETC/IC—80/3(Vol.1), pp 11p, Paper 2) **Electrochemical analysis of surfactants for enhanced oil recovery.** Glover, C.J.; Darby, R.; White, R.E.; Becker, M.C. (Texas A and M Univ., College Station). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

Adsorption/desorption behavior of surfactants is important in the design of micellar solution tertiary oil recovery processes. The purpose of this work was to evaluate electrochemistry as an analytical tool for surfactant concentration measurement for ultimate use in adsorption determinations and continuous monitoring of coreflood effluent concentrations. A previously reported indirect polarographic method gave fair analytical results over a wide range of concentrations of SDBS in solutions containing NaCl or hexane. A modification of the method allowed analysis of the surfactant in the presence of isopropanol, although with somewhat reduced accuracy. The method performed well for an alkyl-ortho-xylene sulfonate.

24978 (DOE/BETC/IC—80/3(Vol.1), pp 3p, Paper 3) **Oilfield water analysis data bank and estimates of water available for enhanced oil recovery in the northern shelf area of Oklahoma.** Bright, J.A.; Mankin, C.J. (Univ. of Oklahoma, Norman). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

To assist in characterizing the Enhanced Oil Recovery (EOR) resource, a file of water analyses (WANL) is being developed as part of the Petroleum Data System (PDS). Over 20,000 analyses have been received from industrial sources this year to augment the WANL file. As one specific application, a study has been started of water resources in the Anadarko Basin which can be utilized in EOR operations for the Cement field. This task has been subcontracted to the Oklahoma Geological Society.

24979 (DOE/BETC/IC—80/3(Vol.1), pp 7p, Paper 4) **Reservoir evaluation and measurement of oil saturation.** Donaldson, E.C.; Heemstra, R.J.; McGhee, J.W.; Ray, R.M. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

BETC initiated research to improve methods of measuring residual-oil saturations of oil reservoirs. This type research was begun in FY-78 and included studies of log-inject-log techniques, analyses of well-logging tools and techniques, single-well tracer methods, measurement and correlation of conditions for entrapment and mobilization of residual oil, pressure coring fluids and techniques, and core analysis, both pressure and conventional core, techniques.

24980 (DOE/BETC/IC—80/3(Vol.1), pp 12p, Paper 5) **Tertiary incentive crude oil program.** Wesson, T.C. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

Between the inception of the Tertiary Incentive Crude Oil Program on October 1, 1979, and August 31, 1980, forty-four organizations and individuals signed on as participants in ten of the eleven Enhanced Oil Recovery methods specified by the Department of Energy. One hundred and fifty-one EOR projects were registered in the program. Of these, about 50% are in the area of Heavy Oil Recovery. The participants include twelve (80%) of the fifteen major oil companies, and 32 other organizations and individuals ranging from companies equal or close to the majors in production and income down to relatively small operations. The purpose of the Incentive Program is to stimulate (A) an increase in domestic production and (B) progress in oil recovery technology. While increased production clearly is the objective of all participants, among the eleven oil recovery methods listed by DOE as applicable to the Incentive Program, the eleventh category, X Other, was chosen by three of the 32 participants which do not qualify as major oil companies; X represents EOR techniques which differ substantially from long-established methodologies and which, therefore, may legitimately be regarded as new. This does not mean that the majors are avoiding new ideas from the laboratories (implied in X) and thus shunning the experimental with its attendant risks, but it does tend to confirm that their ongoing in-house scientific and technical research-and-development is supporting an emphasis on applications. Onsite applications, as distinguished from laboratory discoveries, are an avenue for progress and one in which breakthroughs are just as possible as they are along highly innovative paths.

24981 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 6) **Residual oil saturation determination Wilmington micellar-polymer project, October, 1979-October, 1980.** Staub, H.L. 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

The City of Long Beach, under contract with the US Department of Energy, is conducting a program to obtain residual oil saturation (ROS) data in the HXa Sand, Fault Block VB, Wilmington Field, in which a micellar-polymer demonstration project is being implemented. This program utilizes many complementary techniques for determining the ROS in a watered-out unconsolidated sand typical of many reservoirs in the California Coastal Province. This program is being performed in two stages. The first, Phase 1, was intended to determine the ROS in an area which had been flooded out during the course of a peripheral waterflood. The second stage, Phase 2 of the program, is intended to measure the ROS after tertiary recovery by a micellar-polymer flood. This paper describes certain corrections and refinements of the information earlier described in the Residual Oil Saturation Determination, Wilmington Micellar-Polymer Project, October, 1978 to May, 1979, presented at the Enhanced Oil Recovery Symposium on September 23 to 26, 1979. This paper also describes modifications to output from the diagnostic tools as well as techniques which have been used to establish the ROS. The values of residual oil saturation and other pertinent reservoir parameters determined by each technique are summarized. The advantages and limitations of each method relating to the results obtained are discussed.

24982 (DOE/BETC/IC—80/3(Vol.1), pp 13p, Paper 7) **Waterflood residual oil saturation technology test in a semi-consolidated sandstone reservoir.** Myal, F.R. (Gary Energy Corp., Englewood, CO). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

Gary Energy Corporation has conducted a field test of the technology available to measure residual oil saturation, following waterflood secondary oil recovery processes. The test was conducted in a new well drilled solely for that purpose, located immediately northwest of the Bell Creek Micellar Polymer Pilot. The area where the test was conducted was originally drilled during 1968, produced by primary until late 1970, and was under line drive waterflood secondary recovery until early 1976, when the area was shut in at waterflood depletion. The results of tests conducted to determine waterflood residual oil saturation in the Muddy Sandstone reservoir are summarized. The engineering techniques used to determine the magnitude and distribution of the remaining oil saturation included both pressure and sidewall cores, conventional well logs (Dual Laterlog-Micro Spherically Focused Log, Dual Induction Log-Spherically Focused Log, Borehole Compensated Sonic Log, Formation Compensated Density-Compensated Neutron Log), Carbon-Oxygen Logs, Dielectric Logs, the Nuclear Magnetism Log, Thermal Decay Time Logs, and a Partitioning Tracer Test. An engineering report and economic analysis of the various residual oil saturation determination methods have been completed and currently is being reviewed prior to publication.

24983 (DOE/BETC/IC—80/3(Vol.1), pp 4p, Paper 8) **Selection of reservoirs amenable to micellar flooding.** Goldburg, A. (Gary Energy Corp., Englewood, CO); Price, H. 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

The purpose of this work is to significantly aid, both DOE and the private sector, in gaining the following project objectives: (1) to select the better micellar-polymer prospects in the Mid-Continent and California regions; (2) to assess all of the available field and laboratory data which has a bearing on recovering oil by micellar-polymer projects in order to help identify and resolve both the technical and economic constraints relating thereto; and (3) to design and analyze improved field pilots and tests and to develop a micellar-polymer applications matrix for use by the potential technology users; i.e., owner/operators. Objectives 1, 2 and 3 (corresponding to the three Phases of the Statement of Work) will contribute to bringing on-line micellar-flooding recovery production which will contribute toward meeting DOE's tertiary incremental production goals.

24984 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 9) **Development of a rapid and accurate method for determining partition coefficients of chemical tracers between oils and brines (for single well tracer test).** Carlisle, C.T.; Kapoor, S. (GeoChem Research Inc., Houston, TX). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

GeoChem Research Inc. (GRI) is currently conducting a two-year study of partition coefficients (K-values) used in Single-Well Tracer tests. This study is comprised of two parts. First, a K-value determinator of GRI design was built, tested and optimized for accuracy and speed of K-value measurements. This part of the study has been completed. A second part of the study is focused on how the variation of common reservoir parameters affect the resulting K-values. These parameters are: brine salinity, temperature, crude oil character, gas-to-oil ratio, and chemical tracer concentration. This part of the study has been initiated, and the results will be presented in subsequent reports.

24985 (DOE/BETC/IC—80/3(Vol.1), pp 2p, Paper 11) **Industrial survey of core handling, storage and analysis procedures for ROS measurements.** Ward, C.E.; Barnwell, J.L. (Maurer Engineering, Inc., Houston, TX). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

Core analysis is an essential function in the evaluation of residual oil saturation of a reservoir. The basic techniques of core handling and measurement of porosity, permeability, and fluid saturations are described. Special analysis techniques such as wettability, imbibition, capillary pressure and waterflood tests are also described. Interviews with industry experts provided opinions on the applicability and reliability of the various alternative testing procedures as well as an estimation of the size of the US domestic market in coring and core analysis services.

24986 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 12) **Entrapment and mobilization of residual oil.** Morrow, N.R.; Chatzis, I. (New Mexico Inst. of Mining and Technology, Socorro). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

This report summarizes progress for the first 1-3/4 years of a research project concerned with factors which affect the entrapment and mobilization of residual oil.

24987 (DOE/BETC/IC—80/3(Vol.1), pp 16p, Paper 13) **Summary report on low invasion coring fluids.** Heckes, A.A.; McFall, A.L.; Delgado, S.M. (Sandia National Labs., Albuquerque, NM). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

A program is underway to develop improved low invasion fluids for pressure coring applications. This paper describes the results of an experimental investigation which was performed on seven different low invasion fluids. The investigation employed commercially available calcium carbonate ($CaCO_3$) materials which were compared using two different sandstone core samples (brown and grey berea) and two simulated field conditions (static and dynamic). The results indicate that the presently used mixture of 10 lb/bbl HEC polymer and 300 lb/bbl $CaCO_3$ in a $CaCl_2$ eutectic brine mixture appears to be a very good choice for minimizing invasion of the core sample. Minor improvements in core invasion are achieved by matching the $CaCO_3$ particle size to the formation pore size. Experimentation or prior experience is necessary for choosing the type of $CaCO_3$ to be used. At best, the invasion of the core may only be slowed and not stopped completely. Factors which cause relatively large amounts of filtrate intrusion into the core are long exposure times, low fluid viscosities, and low solids content of the fluid. Curves demonstrating the effectiveness of high polymer and $CaCO_3$ particle concentrations and comparing the core invasion of water, bentonite drilling mud and the seven low invasion fluids are presented.

24988 (DOE/BETC/IC—80/3(Vol.1), pp 14p, Paper 14) **Improved computer-based system for managing information on enhanced oil recovery (EOR) and residual oil saturation (ROS).** Willoughby, J.K.; Gardner, J.A.; Heath, S.B.; Kehler, M.A. (Science Applications, Inc., Englewood, CO). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

A special-purpose information data base system was designed for the Bartlesville Energy Technology Center to support the technical staff in the areas of Enhanced Oil Recovery (EOR) and Residual Oil Saturation Estimation (ROS). The diversity of information requirements and the unavailability of organized information resources to support EOR/ROS prompted the need for this system and its specialized functional design. Studies of information usage patterns and information perceptions by BETC staff resulted in the development of a hierarchic arrangement of subject terms (i.e., a subject taxonomy) emphasizing EOR/ROS and its related subject domain. The analysis of usage patterns also revealed that four basic data types were required most often by potential system users: numeric files; bibliographic citations and abstracts; project information such as schedules and budgets; and references to persons that were authorities in various relevant topical areas.

24989 (DOE/BETC/IC—80/3(Vol.1), pp 14p, Paper 15) **Use of similarity methods in evaluation of reservoir simulators.** Ford, W.T.; Anderson, R.M. (Texas Tech. University, Lubbock). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

The fundamental mathematical structure of problems of two-phase, immiscible, fluid flow in linear, horizontal, homogeneous, porous media has been used to initiate development of a mathematical methodology for evaluation of simulators of such flow, with the expectation that the resulting methodology can be generalized to problems of multi-phase, miscible, fluid flow in porous media for study of computational difficulties in modelling of problems in enhanced oil recovery. This developing methodology, which can be described as a similarity technique, involves reduction of order of porous media problems from systems of partial differential equations to systems of ordinary differential equations. The technique is based on imposition of constancy of physical quantities on members of appropriate families of curves in a space-time coordinate system. The porous media flow equations are shown to allow only common-vertex, coaxial parabolas and parallel lines as curves in the similarity application.

24990 (DOE/BETC/IC—80/3(Vol.1), pp 4p, Paper 16) **Characterization of fluid flow in naturally fractured reservoirs.** Evans, R.D. (Univ. of Central Florida, Orlando). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

This report summarizes the results of a four-month study of the characteristics of multiphase flow in naturally fractured porous media. An assessment and evaluation of the literature were carried out and a comprehensive list of references compiled on the subject. Mathematical models presented in the various references cited were evaluated along with the stated assumptions or those inherent in the equations. Particular attention was focused upon identifying unique approaches which would lead to the formulation of a general mathematical model of multi-phase/multi-component flow in fractured porous media. A model is presented which may be used to more accurately predict the movement of multi-phase fluids through such type formations. Equations of motion are derived for a multi-phase/multi-component fluid which is flowing through a double porosity, double permeability medium consisting of isotropic primary rock matrix blocks and an anisotropic fracture matrix system. The fractures are assumed to have a general statistical distribution in space and orientation. A general distribution function, called the fracture matrix function, is introduced to represent the statistical nature of the fractures. Simplifying assumptions are made concerning flow in the individual fractures, and a hemispherical volume integration of the microscopic fracture flow equation is performed to arrive at a generalized Darcy type of flow equation with a symmetric permeability tensor evolving for the fractures. The equations are generalized for multi-phase/multi-component flow through a fractured medium with variable rock and fluid properties. The report concludes with a brief discussion concerning methods for solving the resulting flow equations. Conclusions and recommendations for further study are also presented.

24991 (DOE/BETC/IC—80/3(Vol.1), pp 13p, Paper 17) **In situ microbial enhancement of oil production by biopolymer or biosurfactant production or selective plugging.** Munnecke, D.M.; Clark, J.B.; Jenneman, G.E. (Univ. of Oklahoma, Norman). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

Microorganisms, due to their diverse metabolic activities, may have a potential for use in enhanced oil recovery processes. In situ growth of microorganisms can possibly produce biopolymers or biosurfactants directly in the oil bearing rock. These may be as effective as conventional injected chemicals, yet avoid the problems encountered with surface production, transportation, and injection of biopolymers and surfactants currently being explored in tertiary oil recovery. In situ growth may also lead to a selective plugging of the water swept portion of a reservoir, thereby allowing a water flood of previously unswept zones. A computer search of information on reservoirs in the top ten producing states shows that 27.2% of the reservoirs have environmental conditions in which microorganisms can grow, based on temperature, salt concentration, pH, permeability, and API gravity characteristics. A screening program to isolate microorganisms capable of growth under simulated reservoir conditions (50C, pH 7, 5% salt, with crude oil or crude oil

plus sucrose as substrate) has yielded microorganisms capable of growth under aerobic and anaerobic conditions. Many of these cultures are also able to produce biosurfactants.

24992 (DOE/BETC/IC—80/3(Vol.1), pp 21p, Paper 18) **Single-well chemical tracer method for measuring residual oil saturation.** Deans, H.A. (William Marsh Rice Univ., Houston, TX). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

The objective of this work was to improve and to further industry acceptance of the single-well chemical tracer method for measuring residual oil saturation (S/sub OR/). During this year, a number of significant advances in the theory of the method were reported. Particularly important is the theoretical basis for optimizing test design to obtain maximum sensitivity to S/sub OR/. Quantitative results were presented for the first time on the effects of fluid drift, flow irreversibility, stratification, and mobile oil. The results of 59 single-well tracer tests which were compiled during this study were reported. These data were donated by the licensees of Exxon Production Research Co., who originated the method. The tests were reviewed with respect to optimal design and field procedures established in the final report. The available techniques for measuring the tracer distribution coefficients (K-values) which are required to obtain S/sub OR/ from the field data were reviewed. Correlations were presented for predicting the K-values for ethyl acetate and propyl formate, two of the most commonly used chemical tracers. Examples were given of several techniques for obtaining S/sub OR/ from the field-measured tracer concentration profiles. The most difficult procedure, detailed simulation using proprietary computer programs, has been used to obtain acceptable interpretations in over 80% of the reported tests.

24993 (DOE/BETC/IC—80/3(Vol.1), pp 11p, Paper 21) **Biodegradation of materials used in enhanced oil recovery.** Grula, M.M. (Oklahoma State Univ., Stillwater). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

A number of additional commercial EOR agents have been screened for biodegradability using the serial transfer enrichment culture method. The method allows the examination of a large number of substances in a relatively short time, and the results can be interpreted in terms of degree of biodegradability, a concept which should be useful in assessing the environmental impact of spills or accidental discharges. Some of the materials studied were Xanthan gum, latex polymers, linear alkylbenzene sulfonates, nonlinear alkylbenzene sulfonates, polyacrylamides, and petroleum sulfonates.

24994 (DOE/BETC/IC—80/3(Vol.1), pp 12p, Paper 23) **Summary of pressure coring developments.** McFall, A.L.; Heckes, A.A. (Sandia National Labs., Albuquerque, NM). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

The current rapid growth in the number of enhanced oil and gas recovery projects has created a strong demand for reservoir data such as true residual oil saturations. The companies providing pressure coring services have moved to fill this need. Two recent developments have emerged with the potential of significantly improving the present performance of pressure coring. Coring bits utilizing synthetic diamond cutters have demonstrated coring rates of one-foot per minute while improving core recovery. It is also apparent that cores of a near-unconsolidated nature are more easily recovered. In addition, a special low invasion fluid that is placed in the core retriever has demonstrated reduced core washing by the drilling mud and a decrease in the complexity of preparing cores for analysis. This paper describes the design, laboratory, and field testing efforts that led to these coring improvements.

24995 (DOE/BETC/IC—80/3(Vol.1), pp 12p, Paper 24) **Studies for the improvement of diamond drill bit hydraulics.** Tibbitts, G.A. (Terra Tek, Inc., Salt Lake City, UT). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

In order to acquire data concerning the hydraulics of diamond bits, pressure transducers have been installed in strategic locations on the bit face of two full scale diamond drill bits. These are used in a Wellbore simulator to obtain data concerning the pressure drops across the face of each bit at various flow rates and rotary speeds. The equipment has been completed, and drilling tests have started.

24996 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 25) **Optimization of air drilling operations.** Ikoku, C.U. (Univ. of Tulsa, OK); Azar, J.J.; Williams, C.R. 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

Air, mist, foam, and other variations of aerated fluid drilling are utilized in various areas because of the improved penetration rate when compared to conventional mud drilling. Other proven advantages include immediate and continuous evaluation of cuttings for hydrocarbon shows, low cost, longer bit life, better control in cavernous and lost circulation areas, and minimum damage to liquid sensitive pay zones. The high compressibility of aerated drilling fluids and multiphase flow phenomena encountered when using these fluids have given rise to sophisticated engineering approach to achieve proper downhole cleaning and materials transport. There have been several attempts to calculate the minimum volumetric requirements for air and gas drilling. The results of these studies are valid over limited ranges of drilling rates at best. The reason is that there are so many variables involved in an air or mist drilling situation that one general correlation has not been developed to explain what is happening downhole and predict appropriate air or gas injection rates in the field. The method described in this paper will permit the driller and drilling engineer to determine optimum fluid injection rates in the field. It eliminates the need for complicated flow calculations used to predict volumetric air requirements.

24997 (DOE/BETC/IC—80/3(Vol.1), pp 9p, Paper 26) **Relation between the cation exchange capacity, clay content and surface area in western reservoir rock.** Volk, L.J.; Raible, C.J.; Carroll, H.B. Jr. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

The cation exchange capacity (CEC), clay content and surface area have been measured for 61 core samples from reservoir rock in the western United States. Although the CEC and surface area do correlate, the scatter is sufficiently large to cast doubt on the use of surface area techniques for measuring the CEC. Likewise, CEC calculated from clay analysis would only be approximate, although refinement does appear possible.

24998 (DOE/BETC/IC—80/3(Vol.1), pp 11p, Paper 27) **Semi-automated method for determining cation exchange capacity of clays in sedimentary rocks.** Gall, B.L.; Volk, L.J.; Raible, C.J. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

The determination of the cation exchange capacities (CEC) of reservoir formations is of interest to the petroleum industry due to the presence of significant amounts of clay. In the past, CEC measurements have been time consuming until an automated method was described by A.E. Worthington. The present work is a modification of the work done by Worthington. Easily assembled equipment is used to agitate rock samples contained in dialysis membrane bags during ion exchange with barium acetate solution and during automatic dilution of the solution to remove excess salt. The amount of barium ions on the rock sample is then determined by conductometric titration with magnesium sulfate.

24999 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 28) **Relationship of permeability to confining pressure in low permeability rock.** Jennings, J.B.; Carroll, H.B.; Raible, C.J. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

Laboratory permeability measurements of low permeability (less than 1 md) reservoir rock is significantly affected by the test confining pressure. Knowledge of the test confining pressure is required to predict permeability at reservoir conditions. A theory is proposed which relates electrical conductivity, permeability and pore dimensions to test confining pressure. Electrical conductivity and permeability measurements were made on test cores having unstressed permeabilities from 20 to 280 microdarcys with confining pressures from 300 to 3200 psi. Initial results show partial agreement with theories.

25000 (DOE/BETC/IC—80/3(Vol.2)) **Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.** Linville, B. (ed.). (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). 1980. 380p. NTIS, PC A17/MF A01.

Of the 31 papers in this volume, 2 are BETC papers based on in-house research, 10 are industry papers describing field experiments, and 19 describe supporting research done by Universities and National Laboratories.

25001 (DOE/BETC/IC—80/3(Vol.2), pp 19p, Paper 1) **Laboratory study of surfactant flooding in the Delaware-Childers field.** Lorenz, P.B.; Tham, M.K.; Bayazeed, A.F. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Laboratory work in support of a field test of the surfactant-polymer process was directed toward supplying data for modeling. Routine measurements were made of waterflood and surfactant-flood recoveries of oil, recoveries of injected chemicals, viscosity of polymer, and relative permeabilities. A first modeling of oil recovery could match laboratory results only after major alterations in relative permeability, and by assuming a strong sensitivity of polymer viscosity to calcium ion. Subsequent tests showed that relative permeability values were affected by the initial oil saturation. Some data were obtained to indicate the magnitude of this effect. A set of relative permeabilities was developed that was more pertinent to lab tests than the previous values. A matrix of viscosities measured at various compositions confirmed that calcium was about 30 times as effective as sodium in lowering the polymer viscosity. On comparison of polymer viscosities in vitro with flood test effluents, it appeared that concentrated polymer was degraded on passage through the cores. It was also found that the resistance factor was generally lower than viscosity would predict. These results were combined with extensive investigations of the surfactant system, and employed in a second modeling which can serve as an improved predictor for field performance.

25002 (DOE/BETC/IC—80/3(Vol.2), pp 9p, Paper 2) **Surfactant optimization for DOE's field test: some unexpected phenomena.** Tham, M.K.; Lorenz, P.B. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

The optimum salinity of the surfactant used in the pilot test conducted by DOE was evaluated in terms of interfacial tension, partition coefficient, phase behavior, and solubilization with Delaware-Childers crude oil. The behavior of the surfactant was studied in the presence of calcium and at several degrees of dilution. Experiments were also conducted to get a value for the equivalent alkane carbon number of the crude oil. This value was found to vary with the nature of the co-surfactant and the water-oil ratio. It was also different depending on the properties measured.

25003 (DOE/BETC/IC—80/3(Vol.2), pp 9p, Paper 3) **Improved oil recovery by alkaline flooding in the Huntington Beach field.** Weinbrandt, R.M.; Campbell, T.C.; Johnson, P.V. (Aminoil USA, Inc., Huntington Beach, CA). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

The area where Aminoil USA is conducting a pilot test of the alkaline flooding process is in the Lower Main Zone of the Huntington Beach Field. This area of the field was originally drilled in 1940 and produced by primary until 1969 at which time a pilot waterflood was initiated in Fault Block 22 and 23 using a single, normal 5-spot pattern. Faulting provides partial isolation of these blocks from the rest of the field. Approximately two pore volumes of water have been injected into the 17,000 ac ft project area that is currently producing at a water-oil ratio of 28. The same fault block and pattern where the waterflood was pilot tested is being used for the alkaline flood pilot test program. Injection of the softened produced water preflush commenced in June 1978 at a 10,000 B/D rate into the four injection wells of the 5-spot pattern. All wells in the project area had either been redrilled or worked over prior to inititation of preflush injection resulting in excellent well performance. Operation of the surface facilities and softening plant has been routine over the period of preflush injection. Alkaline injection commenced on March 10, 1980 at a concentration of 0.2% sodium orthosilicate in 7500 ppM sodium chloride solution at an average injection rate of 8500 B/D. No injectivity problems were experienced during this period of alkaline injection. To date, no production response has been observed due to chemical injection.

25004 (DOE/BETC/IC—80/3(Vol.2), pp 8p, Paper 4) **Improved oil recovery by micellar-polymer flooding El Dorado, Kansas, field.** Van Horn, L.E. (Cities Service Co., Wichita, KS). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

During the sixth year of the project, polymer injection continued as planned. Investigations of bacterial contamination problems resulted in changes in use of biocide. Performance models were refined and applied to the preflush sweep of the north (Chesney) pattern. Core flood models for the north pattern matched performance satisfactorily. Models are being used to investigate the North pattern polymer design.

25005 (DOE/BETC/IC—80/3(Vol.2), pp 8p, Paper 5) **Alkaline waterflooding demonstration project Ranger Zone, Long Beach Unit, Wilmington Field, California.** Carmichael, J.D. (City of Long Beach, CA); Mayer, E.H. 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Preflushing continued through March 27, 1980, after which soft water-salt-sodium orthosilicate injection began. A loss of injectivity caused the salt to be temporarily removed from the injection on May 30. Laboratory work included completion of core flood tests which were discouraging. The subcontract on alkaline consumption by reservoir sands was completed. Crude oil-water dehydration tests indicated that emulsion problems can be solved with existing field systems.

25006 (DOE/BETC/IC—80/3(Vol.2), pp 17p, Paper 6) **Micellar-polymer joint demonstration project, Wilmington Field, California.** Staub, H.L. (City of Long Beach, CA). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

After 14 months of preflush, the micellar slug was injected starting July 12, 1979, and finishing October 11, 1979. It was immediately followed by the polymer buffer which is injected in steps of decreasing concentration. The third step of the polymer injection was reached in June 1980. Production performance demonstrated a dramatic response to the micellar polymer increasing from 50 B/D in January to 109 B/D in February and 188 B/D in June.

25007 (DOE/BETC/IC—80/3(Vol.2), pp 7p, Paper 7) **Big Muddy low-tension flood process demonstration project.** Ferrell, H.H. (Conoco Inc., Ponca City, OK); Davis, J.G. 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

The Big Muddy project is designed to demonstrate the feasibility of low tension flooding for oil recovery in a low permeability reservoir. The preflush injection started in February, 1980, and chemical injection is expected to start January, 1981. Problems persist in one injection well, in spite of several attempts at stimulation, and a replacement well will be drilled. All other wells are now ca-

pable of design rates or above. The project performance is briefly reviewed. The plant design and chemical selection are also discussed.

25008 (DOE/BETC/IC—80/3(Vol.2), pp 7p, Paper 8) **Enhanced oil recovery by improved waterflooding in the Storms Pool Field, Illinois.** Craig, F.F. III. (Energy Resources Co. Inc., Houston, TX). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Energy Resources Co. Inc., and its subcontractor Elf Aquitaine Oil and Gas Company, are conducting a pilot polymer flood in the Storms Pool Field near Carmi, in White County, Illinois to improve the sweep efficiency and show that the engineering, management, and financial resources required for such tertiary techniques can be applied by independent operators to similar fields which might otherwise be abandoned. The pay is consolidated sandstone with a thickness of 50 feet, porosity of 19% and the permeability varies from 50 to 900 md. Formation water is 38,000 ppM TDS, while injection water is 200 ppM TDS. During the past fiscal year, numerous developments have continued and include: final polymer selection, design of the graded polymer banks, reservoir pressure tests, completion of basic plant construction, and initiation of pre-flush injection. Preparations are currently underway to begin polymer injection in early November, 1980.

25009 (DOE/BETC/IC—80/3(Vol.2), pp 13p, Paper 9) **Micellar-polymer oil recovery demonstration in the Bell Creek Field, Montana.** Goldburg, A.; Stevens, P. (Gary Energy Corp., Englewood, CO). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Gary Energy Corporation is conducting a DOE Demonstration Pilot to determine whether micellar-polymer waterflooding is an economically feasible technique for enhanced oil recovery at the Bell Creek Field, Powder River County, in southeastern Montana. The pilot is a contained 40-acre 5-spot embedded in a representative watered-out portion of the field. The net pay is sandstone with average properties: thickness, 6.4 feet, porosity, 25%, permeability (air) 1050 md, and water TDS of 4000 ppM. The pilot area interwell oil saturation after waterflood available for tertiary recovery is presently evaluated at 28%; and the overall micellar-polymer recovery is estimated at 47%. During the past year site development continued and included: conclusion of the radioactive tracer survey, completion of the Bell Creek core analysis by Core Laboratories, injection well shut-in and two-rate tests to determine the probable extent of the geologic anomaly and better determine its proximity to injection well MPP-3, completion of the simulation work by Intercomp for the three major phases of the project, and continued production monitoring. Preflush and the Soluble Oil/Micellar Water injection was initiated and completed and the polymer mobility buffer injection is now in progress. The other major effort for the year was the field experimentation to achieve an optimal oxygen scavenging program to protect the graded polymer bank from viscosity degradation.

25010 (DOE/BETC/IC—80/3(Vol.2), pp 12p, Paper 10) **Commercial scale demonstration of the Maraflood process: M-1 project, Crawford County, Illinois, 1979-1980.** Snyder, W.O. (Marathon Oil Co., Bridgeport, IL). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Micellar solution injection took place starting February 10, 1977 during a 22-month period followed by injection of a sequence of various mobility buffer concentrations which for the past 19 months has proceeded routinely. A production response has been witnessed in the 2.5-acre pattern area. This response is following closely the original prediction. No positive response has been seen in the 5.0-acre pattern area. Indications of a response are present, but several months will be required to verify these data. Modifications to the production facility and treating techniques are reported in detail.

25011 (DOE/BETC/IC—80/3(Vol.2), pp 6p, Paper 11) **Penn Grade Micellar Displacement Project.** Danielson, H.H.; Paynter, W.T.; Ondrusek, P.S.; Finalle, L.L. (Pennzoil Exploration and Production Co., Bradford, PA). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

The Penn Grade Micellar Displacement Project is a teriary oil recovery test of a micellar-polymer process in the Bradford Field in northwestern Pennsylvania. The 24-acre test consists of nine normal five-spot patterns on one and one-half acre spacing, surrounded by sixteen additional production wells. The Bradford Third Sand exhibits the following reservoir properties in the project area: net sand, 29 feet; porosity, 12.7%; permeability, 7.65 md; post waterflood S/sub o/=0.40; and post waterflood S/sub w/=0.60. During the fifth contract year (June 1979 to June 1980), operations continued with no significant change in performance. The injection of the body phase of the polymer sequence continued throughout the year raising cumulative injection from 5.7% PV to 20.3% PV. Total slug and polymer injection was 45.01% PV as of June 30, 1980, with a major decision point to occur at 50% PV.

25012 (DOE/BETC/IC—80/3(Vol.2), pp 8p, Paper 12) **North Burbank Unit tertiary recovery pilot test.** Kleinschmidt, R.F.; Trantham, J.C.; Glinsman, G.R.; Hollis, P.R.; Zornes, D.R. (Phillips Petroleum Co., Bartlesville, OK). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

During the last 15 months, fresh water injection was continued, while efforts were made to raise injection rates to the highest level consistent with proper reservoir control. Reservoir management during the period consisted of attempts to improve productivity of some wells, tracer studies to locate flow channels, fluid diversion treatments to seal channels and improve sweep efficiency, and continuing surveillance of injection wellhead pressure trends to maintain control of fractures feeding the fluid into the rock matrix. Fluid drift control was improved. Chemical analyses of fluids showed that production of surfactant components and polyacrylamide declined steadily almost to the vanishing point in all the producers. The oil production rate has declined slowly since reaching its peak level of 286 BPD in April, 1978, and appears to be on an exponential decline curve which projects the continuation of tertiary oil production several years into the future. As of August 11, 1979, the total oil production rate was about 195 BPD at a water-oil ratio of about 66. At that time, a total of 153,500 barrels of tertiary oil had been recovered. Evaluation of the pilot results was conducted using a two-dimensional chemical flood simulator. The tertiary oil recovery will not meet original predictions, largely because of limitations in the one-dimensional simulator available and a scarcity of reservoir data at the time the original predictions were made. There is also evidence that oil recovery could be suffering to some extent from interaction between formation water cross-flowing into zones containing active surfactant solution from adjacent tighter zones through which no preflush has passed.

25013 (DOE/BETC/IC—80/3(Vol.2), pp 12p, Paper 14) **Adsorption from flooding solutions in porous media: a study of interactions of surfactants and polymers with reservoir minerals.** Somasundaran, P. (Columbia Univ., New York, NY). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Past work on adsorption/abstraction of Na-dodecyl-benzenesulfonate and Mahogany sulfonate on homoionic Na-kaolinite, Berea sandstone, Agricultural limestone and Bedford limestone showed that the nature and extent of adsorption is strongly dependent on the type and concentration of electrolytes, pH, solid-to-liquid ratio, surfactant purity and solids pretreatment. During the past year, adsorption/abstraction of sulfonates on Na-kaolinite was extended to high salinity (up to 1 kmol/m^3 NaCl) conditions. Kinetic and equilibrium studies of adsorption of Na-dodecylbenzenesulfonate in the presence of oil has been initiated. A major emphasis, during the past years, was placed on the study of the phenomenon of surfactant precipitation in the presence of multivalent ions and redissolution and reprecipitation of it upon increasing the surfactant concentration. Precipitation/redissolution/repre-

cipitation of sulfonates in the presence of NaCl, $CaCl_2$ and mixtures of NaCl and $CaCl_2$ was studied. Characterization of surfactant precipitation and clay using techniques such as SEM and EDXRF has also been initiated. Based on these studies as well as the study of other system properties such as CMC and Draft point solubility the mechanism of redissolution is formulated. The Na-dodecylbenzenesulfonate used for the adsorption and precipitation experiments conducted during the current period was purified by recrystallization and characterized by using analytical LC, proton NMR, ^{13}C NMR and mass spectrometry. Oil and air wettability of reservoir rock minerals treated with sulfonates has been correlated with the surfactant adsorption at the solid/liquid interface and the accompanying zeta potential changes and the mechanisms of adsorption have been further developed using resultant correlations.

25014 (DOE/BETC/IC—80/3(Vol.2), pp 6p, Paper 15) **Produced fluid emulsions associated with surfactant-polymer flooding.** Hurley, C. (Energy Resources Co. Inc., Houston, TX). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Energy Resources Company is currently involved in a DOE project to determine what emulsion problems, if any, are caused by the application of surfactant-polymer flooding techniques for recovering oil. Eight actual fields in which surfactant-polymer flooding has taken place were chosen to be studied. These include: Citgo El Dorado Field - Chesney Pattern, Citgo El Dorado Field - Hegberg Pattern, Phillips - Burbank Field, Marathon - Robinson Field, Long Beach - Wilmington Field, Penn Grade - Bradford Field, Gary Energy - Bell Creek Field, Conoco - Big Muddy Field. Besides investigating those parameters that cause emulsions, techniques are to be identified for treatment of any of the emulsions that occur. These emulsion breaking techniques are to be devised with the object in mind of treating actual field production in order to produce saleable oil. The results of this research should provide a large body of knowledge that can be successfully applied as needed to both demonstration and commercial surfactant-polymer enhanced oil recovery projects.

25015 (DOE/BETC/IC—80/3(Vol.2), pp 12p, Paper 16) **Experimental evaluation of reservoir pretreatment in chemical flooding.** Surkalo, H.; Pouska, G. (Exoil Services, Golden, CO). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

The purpose of this study has been twofold. First, by employing radial disks, the effect of flow geometry found in a field application has been incorporated into the experimental study. At the same time, the ultimate measure of preflush effectiveness, the incremental oil produced as a result of the pretreatment, has been chosen as the yardstick for comparison. Second, by combining the scope of several previously reported studies covering a few inorganic and organic preflush chemicals into one study with a single source of rock, the effect of substrate variability could be isolated from the analysis. This work in Berea sandstone is considered a foundation for similar studies to be completed in reservoir rock, where the effect of different clay compositions and rock heterogeneities can be compared to the standardized case with Berea sandstone.

25016 (DOE/BETC/IC—80/3(Vol.2), pp 13p, Paper 17) **Support services on the enhanced oil recovery field test program.** Sharp, J.M.; Hocott, C.R. (Gulf Universities Research Consortium, Bellaire, TX). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Support services have been provided by Gulf Universities Research Consortium on the enhanced oil recovery field test program. Seven tasks have been ongoing having the objectives of the development and analysis of data and information pertaining to research, development, test and evaluation programs concerned with the enhanced recovery of crude oil. In the course of performance of these tasks four reports have been distributed. The contents of each of these is summarized. The reports are titled: The Application of Instrumentation to Reservoir Description for Enhanced Oil Recovery; Computerized Procedure for Data Validation and Resource Calculation for Oil Reservoirs; Chemicals for Surfactant-Polymer Flooding in Enhanced Oil Recovery; and An Assessment and Update of Screening Criteria for Carbon Dioxide Miscible Flooding.

25017 (DOE/BETC/IC—80/3(Vol.2), pp 13p, Paper 18) **Mechanism of oil bank formation, coalescence in porous media and emulsion stability: II.** Wasan, D.T. (Illinois Inst. of Tech., Chicago). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Results are presented of a basic study of coalescence phenomena, emulsion formation and stability, and dynamic interfacial properties when crude oils and pure hydrocarbons are contacted with aqueous solutions of surfactant/polymer and alkaline agents. These measurements are correlated with each other and with observations on oil bank formation and displacement and recovery efficiency by chemical flooding in microwave monitored laboratory core flooding experiments. The work performed during the past year, was a mixture of experimental work, correlative work, and further theoretical analysis. It encompassed the following three interrelated tasks: (1) caustic flooding of heavy crude - understanding the role of high molecular weight crude components and the types and properties of emulsions in improved oil recovery, (2) experimental investigations into the establishment of the oil banking characteristics of surfactant and micellar/polymer solutions by cinephotomicrographic observations in a model porous medium and by microwave monitored laboratory core floods, and (3) further development of a theoretical model and an experimental technique to study thin liquid film stability associated with emulsion and foam systems.

25018 (DOE/BETC/IC—80/3(Vol.2), pp 12p, Paper 19) **Development of improved mobility control agents for surfactant/polymer flooding.** Martin, F.D.; Donaruma, L.G.; Hatch, M.J. (New Mexico Inst. of Mining and Technology, Socorro). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

During the second year of the project, the baseline testing of commercial products was completed. These baseline tests with polymers include studies on: mobility control, retention, and shear degradation in Berea cores; the effect of common ions on rheological properties; thermal stability; microbial degradation; and surfactant-polymer interactions. These data are used for comparison of the commercial agents at standarized sets of conditions, and are also used to evaluate new, modified, or improved polymers. Work was also initiated on the synthesis, characterization, and preliminary screening of new and modified polymers. The modified materials consist of polymers analogous to the commercially available synthetic polymers, with specific structural alterations. Testing of these analogs provides systematic correlations of polymer performance with polymer structure. This preliminary testing consists of measurements of shear degradation and viscosity loss in NaCl brines by the use of a simplified screening procedure. Promising candidates are subsequently evaluated in more detail with procedures similar to the baseline testing of commercial products. Structural changes in the polymer molecules needed to correct inadequacies that exist with commerical products are currently under investigation. To date, a number of potential structure-utility relationships have been observed. Solution viscosities of all non-ionic polymers tested are essentially insensitive to changes in NaCl concentration. Increasing the charge-to-mass ratio (degree of hydrolysis) of either polyacrylamides or N-alkyl analogs enhances the ability of these polymers to build viscosity in low salinity NaCl brines.

25019 (DOE/BETC/IC—80/3(Vol.2), pp 14p, Paper 20) **Interfacial effects in the recovery of residual oil by displacement: studies at Northwestern University.** Slattery, J.C. (Northwestern Univ., Evanston, IL). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

The optimal design of a tertiary recovery flooding process depends upon the ability to anticipate how changes in the interfacial viscosities, interfacial tension, and the wetting characteristics of the porous medium will affect the relative permeability and capil-

lary pressure functions. An analysis of displacement in a cylindrical pore has been completed. A study of displacement through an irregular pore, the diameter of which is a sinusoidal function of axial position, is nearing completion. The results are consistent with the earlier predictions of a qualitative analysis. As a bubble or drop is forced towards a phase interface, a thin film forms, drains, becomes unstable, and coalescence occurs. Two papers have been finished that discuss the drainage of thin liquid films. It appears that the surface viscosities may play a minimal role in the drainage process. No judgment is possible from these analyses about the effect of the interfacial viscosities upon the stability of a film or, ultimately, upon coalescence. A structural model has been developed for a porous medium in the form of a radomized, three-dimensional network that can be employed to correlate for a given system the single-phase permeability, the drainage and imbibition capillary pressure curves, and the two drainage relative permeability curves as measured during steady-state flows. The subsequent portions of the hysteresis loops for capillary pressure and for the relative permeabilities then can be predicted. This is the first time that a structural model has been successfully used to correlate for a given system the single-phase permeability, the drainage and imbibition capillary pressure curves, and the two relative permeability curves.

25020 (DOE/BETC/IC—80/3(Vol.2), pp 15p, Paper 21) **Micellar-flood research: biopolymers, interfacial and phase behavior, and competitive adsorbates.** Johnson, J.S. Jr. (Oak Ridge National Lab., TN). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Sclerotium rolfsii grows and produces scleroglucan biopolymer in fermentation broths of moderate salinities. It appears that brackish waters, and perhaps seawater, could be used in field production. Results of pilot-scale tests of microscreens indicate that they are a feasible method of removing the bulk of biomass from fermentation broths, without serious loss of biopolymer, in either on-site or centralized production. A series of sodium oleates with alkyl substituents on the carbon next to the carboxylate were prepared and the phase behavior of aqueous/hydrocarbon systems containing them was investigated as a function of alkane molecular weight and of salinity. Three coexisting phases were found over ranges of systems compositions, and minima in interfacial tensions between phases occurred in these compositional regions in a case studied, sodium 2-ethyl oleate. Conditions were found under which neutralized tall oils, of which sodium oleate is a prominent constituent, gave interfacial tensions of the order of a millidyne/cm. Addition of ethoxylated tall oils to petroleum sulfonate surfactants increased the salinity tolerance. Interfacial tensions between pairs of phases in three-phase systems appear to conform to Widom's inequality. Further evaluations were carried out of the caustic extract from bleaching process after the pulping of wood by the kraft process, as well as of other pulping byproducts and wastes, as a sacrificial agent to reduce loss of surfactants on formation minerals. Alkyl-substituted sodium salicylates and sodium cyclohexane carboxylate were found to have strong effects in solubilizing toluene in water.

25021 (DOE/BETC/IC—80/3(Vol.2), pp 13p, Paper 22) **Surfactant synthesis, polymer buffer and surfactant slug design for the tertiary recovery of the Pennsylvania grade crude oil.** Klaus, E.E.; Duda, J.L.; Jones, J.H.; Ertekin, T.; Stahl, G.D.; Nagarajan, R. (Pennsylvania State Univ., University Park). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

A vapor phase oxidation process was developed for the oxidation of paraffinic and naphthenic hydrocarbons involving a raining solids type reactor and also a steam or nitrogen moderated reactor. Reaction conditions were identified for the production of predominantly oxidized hydrocarbons with minimal carbon chain breakage. The oxidation products serve as feedstocks for the production of sulfonates, in addition to their direct use as cosurfactants. The oxidized hydrocarbons, the monosulfonate and the polysulfonate fractions were all used in the preparation of surfactant slugs for core flood tests. The solution properties of xanthan polymer buffers which show distinct differences between the dry powder form of xanthan and the xanthan available as broth were evaluated. The differences have been traced to the fact that the polymer molecules in xanthan powder are denatured in contrast to the native, helical conformation of the molecules in xanthan broth. The flow behavior of xanthan gum and polyacrylamide in various types of porous media were studied and a mechanistic interpretation of the residual permeability reduction in the porous media was developed. The results suggest that in addition to adsorption, mechanical entrapment, and shear rate effects, the inaccessible pore volume effects also play a role in determining the effective and residual permeability reduction in the porous media.

25022 (DOE/BETC/IC—80/3(Vol.2), pp 24p, Paper 23) **Enhanced recovery with mobility and reactive tension agents.** Radke, C.J.; Somerton, W.H. (Univ. of California, Berkeley). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

An equilibrium chemical displacement model is presented. The unique feature of this theory is that the chemistry of the acid hydrolysis to produce in-situ surfactants is rigorously included. Calculations with the model reveal delayed and reduced tertiary oil recovery for adverse mobility ratios, and the critical importance of quantifying alkali rock interactions. Design of alkaline floods based only on properties of the fluid phases, such as interfacial tension, interfacial viscosity, or emulsion stability, can be obviated by the paramount role of rock-chemical reactions. Displacement tests of Wilmington oil-field cores with alkali at reservoir rates show low and delayed tertiary oil recoveries. Significant improvement in tertiary oil production is found when mobility control is established by addition of polymers or flooding at higher temperatures. The interaction of caustic with Wilmington sands consists of a reversible sodium-hydrogen base exchange, a slow kinetic-controlled dissolution of siliceous mineral matter, and insoluble hydroxide formation due to reaction with exchanged hardness ions. The sodium hydrogen ion exchange isotherm is Langmuirian with a hydrogen exchange capacity at reservoir conditions of 0.8 meq/100 g. It controls the frontal advance rate of caustic in the reservoir. Preliminary analysis of the dissolution of Wilmington cores by caustic suggests a reaction rate which is first order in hydroxide. A chromatographic ion-exchange theory is developed to describe simultaneous sodium-calcium base exchange with precipitation of calcium hydroxide. The most important finding from this theory is that alkaline preflushing with caustic to increase the efficiency of hardness ion removal does not appear promising.

25023 (DOE/BETC/IC—80/3(Vol.2), pp 15p, Paper 24) **Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems.** Shah, D.O.; Walker, R.D. Jr.; O'Connell, J.P. (Univ. of Florida, Gainesville). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Research on Interfacial Phenomena was concerned primarily with understanding more fully the mechanisms by which ultralow interfacial tension can be achieved and oil mobilized. The role of surface charge density was studied further and the role of additives, in improving salt tolerance elucidated. The possibility of surfactant-polymer interactions was investigated and little evidence for the phenomenon was found. The influence of salinity in connate water and in polymer solution on oil recovery was studied, and maximum oil recovery appears to occur when both salinities are at the optimal salinity of the surfactant formulation. However, the polymer slug salinity was found to be more important. Phase behavior resulting from temperature and pressure variations in the sodium stearate/NaCl brine/hexadecane/isobutanol system show the same features as the best established sulfonate systems, but a significant alcohol-level dependence is observed. The potassium oleate/water/n-hexadecane system shows several phases simultaneously, including liquid crystals. Transient and nonequilibrium effects of temperature and pressure have been observed in petroleum sulfonate and stearate systems. Research in the Rock/Fluid Interactions area was principally concerned with surfactant salting-out by NaCl and precipitation by multivalent cations. The salting-out of several anionic surfactants by NaCl was measured and it was observed that surfactant was salted-out, apparently according to a mass action relationship, but that the salting-out levelled off at a certain concentration range. A new type of salting-out diagram and a basic theoretical treatment of the phenomenon have been developed.

25024 (DOE/BETC/IC—80/3(Vol.2), pp 8p, Paper 25) **Dynamic interfacial properties and their effects on oil ganglia reconnection and displacement processes.** Flumerfelt, R.W. (Univ. of Houston, TX). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

This report summarizes recent observations on the dynamic interfacial properties and their effects on oil ganglia reconnection during surfactant flooding. Studies have been conducted on a number of oil/brine/surfactant systems. These include tests with iso-octane and crude oil oleic phases and several commercial surfactants. Observations to date indicate large variations in the sum of the interfacial dilation and shear viscosities eta, depending on salt concentrations. The lowest values of eta are observed in the region of optimal salinity where, typically, values on the order of 10^{-3} s. poise, or less, are observed. Outside the region of optimal salinity, significantly larger values are obtained, particularly, at salt concentrations which are below optimal. Droplet-droplet coalescence studies in a spinning drop device also show significant variations in coalescence rate depending on salt concentration. As noted before, the fastest coalescence (or reconnection) is observed in the neighborhood of optimal salinity. Significantly lower rates are observed outside this region with stable emulsions being noted at low salt concentrations. Although surface viscous and elastic effects are important to such processes, it appears that the critical variable is the collapse thickness of the thin film separating adjacent droplets. In general, the results reported here have implications to the kinetics of oil bank formation and to the often observed in situ formation of troublesome stable macroemulsions during surfactant flooding.

25025 (DOE/BETC/IC—80/3(Vol.2), pp 5p, Paper 26) **New concepts for enhancing petroleum recovery.** Davis, H.T.; Miller, W.G.; Scriven, L.E. (Univ. of Minnesota, Minneapolis). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Percolation theory of transport has been used to explain the correlation between the residual saturation of non-wetting phase in porous media after displacement by a wetting phase and the capillary number. Suspensions of clay mineral particles have been studied by scanning electron microscopy after being frozen. A novel spinning-tube technique to measure microemulsion viscosities of multiphase systems has been developed. Idealizations of basic mechanisms of oil recovery have been analyzed with graphical constructions of the Buckley-Leverett type.

25026 (DOE/BETC/IC—80/3(Vol.2), pp 14p, Paper 17) **Relative permeability of low tension systems at elevated temperatures.** Amaefule, J.O.; Handy, L.L. (Univ. of Southern California, Los Angeles). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

In systems where chemicals are used as enhanced oil recovery agents, the residual oil is mobilized and displaced. The mechanism by which low tension systems diplace oil from porous media is not completely understood. The limited understanding of the key reservoir parameters that control performance in low tension systems constitutes a major technical constraint in the development of new oil recovery processes. This problem is even worse in systems where chemicals are considered for use as steamflood additives. The project to evaluate the relative permeability of systems containing low tension additives was initiated to provide some mechanistic insight as to how the injected chemicals would affect the fluid distributions and flow behavior. The results of a laboratory investigation of the effect of low interfacial tensions on oil-water relative permeability curves are presented. The effect of various IFT values on capillary pressures were evaluated. The relative permeabilities to oil and water at a given water saturation were found to increase with decreasing interfacial tensions. The capillary pressure decreased as expected and showed a shift towards lower saturations with decreasing tensions, indicating some possible wettability alteration. The irreducible water and residual oil saturations decreased as interfacial tension decreased. The results of this study will be used as input parameters for simulators predicting process performance and efficiency of enhanced recovery projects where chemicals are considered for use either as water or steamflood additives.

25027 (DOE/BETC/IC—80/3(Vol.2), pp 10p, Paper 28) **Some useful concepts derived from petroleum component properties for improved waterflooding studies.** Yen, T.F.; Chan, M.; Jang, L.K. (Univ. of Southern California, Los Angeles). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

The effect of crude oil composition on the caustic flooding performance of a reservoir was studied. The polar compounds were shown to be strongly effective in reducing the interfacial tension. A sequential caustic flooding procedure was proposed and shown to increase the amount of petroleum acids available at the low interfacial tension and thus to increase the total yield. It was shown that an acid pretreatment releases acids for the caustic flood and increases the yield of oil. An equilibrium model for caustic flooding was proposed.

25028 (DOE/BETC/IC—80/3(Vol.2), pp 14p, Paper 29) **Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery.** Neidlinger, H.H.; McCormick, C.L.; Hester, R.D.; Wildman, G.C. (Univ. of Southern Mississippi, Hattiesburg). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Aqueous solutions of acrylamide copolymers have been widely used as mobility control fluids in enhanced oil recovery. To obtain more detailed information on the effects of polymer composition and structure on aqueous solution rheological behavior, series of the model copolymers poly(acrylamide-co-sodium acrylate), poly(acrylamide-co-sodium-2-sulfoethylmethacrylate), poly(acrylamide-co-sodium-2-acrylamido-2-methylpropanesulfonate) and dextran-g-acrylamide have been synthesized and investigated with respect to their solution behavior. Mechanistic and kinetic studies were conducted with macromolecular characterization including use of an unique size exclusion chromatographic technique. Dilute solution viscosity of the copolymers has been studied as a function of polymer concentration, salt concentration, pH, temperature, shear rate and time. All polymers showed pseudoplastic behavior. For copolymers with more than 30 mol % of ionic comonomer, the molecular expansion and therefore the viscosity sharply decreases when salts are added.

25029 (DOE/BETC/IC—80/3(Vol.2), pp 23p, Paper 30) **Mobility control and scaleup for chemical flooding.** Pope, G.A. (Univ. of Texas, Austin). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

During the first year of this project, only one-dimensional core floods were planned and conducted. A limited number of two-dimensional core floods are planned for the second year. Also the two and three phase flow tests have not included polymer yet, so no data on inaccessible pore volume during multiphase flow are available to date. A considerable amount of polymer data has been obtained in connection with both physical property and single phase flow experiments, however. The physical property data include viscosity, phase behavior, and interfacial tension. The numerical simulation work includes both one and two dimensional versions of micellar/polymer flooding. The existing one dimensional simulator has been improved in many ways and several different numerical techniques have been tested using it. It has been used to match a number of oil recovery tests, and this activity is continuing and will soon include tests for this purpose.

25030 (DOE/BETC/IC—80/3(Vol.2), pp 9p, Paper 31) **Optimum surfactant systems for oil recovery.** Scamehorn, J.F.; Graciaa, A.; Schechter, R.S.; Wade, W.H. (Univ. of Texas, Austin). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

One purpose of the University of Texas research program is to develop better surfactant systems for oil recovery. A number of different approaches designed to accomplish these goals are currently being explored. Two of these studies have been selected for presentation here. In one study it was shown that properly structured nonionic surfactants are as effective, and perhaps can be made

more effective, in solubilizing oil and water and lowering the interfacial tensions as those anionic surfactants currently in use. These nonionic surfactants would have the advantage of being tolerant to wide variations in electrolyte composition and concentration. Mixtures of nonionic and anionic surfactants were shown to exhibit substantial negative deviations (lower CMC) from ideal solution theory. It was also shown that such deviations may be important with regard to the development of minimally adsorbing surfactant systems.

25031 (DOE/BETC/IC—80/3(Vol.4), pp 4p, Paper 33) **Compilation of a handbook of environmental regulations affecting enhanced oil recovery.** Wilson, T.D.; Scott, J.P. (Spears and Associates, Inc., Tulsa, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 1980.

Under the direction of the Bartlesville Energy Technology Center (BETC), Spears and Associates assembled a reference source containing all environmental regulations and guidelines relating to EOR. This reference source is in a language format which will make it a useful tool to personnel involved in on-site field operations. The EOR environmental handbook will allow those personnel developing EOR programs and managing EOR field operations to minimize possible difficulties in operating within environmental regulations established by federal, state, and local governments.

25032 (DOE/BETC/IC—80/3(Vol.4), pp 9p, Paper 34) **Determination of EOR technology transfer requirements: a survey of the data needs of the oil industry and other users of EOR technical information.** Wilson, T.D.; Scott, J.P. (Spears and Associates, Inc., Tulsa, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 1980.

Spears and Associates, Inc., conducted a detailed field study to determine the technical information needs of current and potential users of enhanced oil recovery data. Under the direction of the Bartlesville Energy Technology Center (BETC), the study was designed to: (1) identify groups which have a need for EOR-related information, (2) determine the specific information needs of each user-group, and (3) outline methods for improved transfer of appropriate information to the end users. Closely allied to those tasks, this study was designed to uncover attitudes toward the EOR-related efforts of the US Department of Energy (DOE) and the BETC and determine the role each should play in facilitating the commercialization of EOR processes. The purpose of the project was to provide information to the BETC so that the commercialization of EOR processes could be accelerated by the improved transfer of state-of-the-art EOR technology. That task, together with the associated task of defining the role the DOE and BETC should play in the encouragement of EOR activities, was designed to increase the production of domestic oil reserve and lessen the US's dependence upon foreign oil imports.

25033 **(DOE/BETC/OR—19) Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980.** Ho, P.C.; Kraus, K.A.; Bender, T.M.; Ogden, S.B. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 59p. NTIS, PC A04/MF A01.

In the period of this report, studies of the hydrotropic properties of organic alkylbenzenesulfonates and particularly of alkylbenzenecarboxylates were extended; the effects of several different alcohols on miscibility between aqueous protosurfactant solutions and aliphatic and aromatic alkanes were investigated; hydrotropic properties of an alicylic carboxylate were determined; the equivalent weight of the organic salts studied was extended into the surfactant range; solubilities of protosurfactants and surfactants in salt solution were measured; and investigations of the adsorption of protosurfactants on minerals as a function of salinity were started. Pseudo three-component representations of hydrocarbon/alcohol/aqueous protosurfactant solutions (constant ratio of organic salt to water) have now been studied extensively, particularly in the case of toluene/1-butanol/aqueous sodium 2,5-diisopropylbenzenesulfonate. Measurements include establishment of the phase behavior in the limiting three-component systems, the effect of protosurfactant concentration in the four-component systems, and determination of the compositions in a limited number of cases of the coexisting phases. In extension of the equivalent weight of organic salts into the recognized surfactant regime, some were found to give miscibiity patterns which appeared to be reasonable extrapolations of the protosurfactants systems and some were quite different. Solubilities of surfactants restrict investigation to compositions having asymmetric boundaries. In these, it appears that protosurfactants are more effective in promoting miscibility than surfactants. Solubilities of organic salts in NaCl solutions, both of protosurfactants and surfactants, decline much more sharply with NaCl concentration than a constant product of the sodium ion concentration times the organic ion concentration would predict.

25034 **(DOE/ET/12056—12) Numerical modeling of thermal recovery processes SUPRI-TR-12.** Soliman, M.; Brigham, W.E.; Raghaven, R. (Stanford Univ., CA (USA). Petroleum Research Inst.). Jun 1981. Contract AC03-76ET12056. 30p. NTIS, PC A03/MF A01. Order Number DE81025642.

This work treats a theoretical investigation of forward combustion in a simulated laboratory combustion tube. A mathematical model has been developed that includes the thermal, thermodynamic, and hydrodynamic aspects of the process. Oil is assumed to burn directly. A fully implicit scheme is used in a simultaneous technique which seems to be much faster than the Gottfried model. Our model yields spatial distributions of pressure and temperature and saturations and concentrations of all important components (oil, water, oxygen, inert gas, and steam). Finally, it gives production rates, cumulative production, and instantaneous and cumulative WORs and GORs. The various computed profiles and the associated phenomena are interpreted. Comparison with other numerical models is made. The developed model can also simulate other thermal recovery processes, such as hot water flooding and steam injection.

25035 **(SAND—81-0882C) Summary of DEEP STEAM downhole steam generator development activities.** Donaldson, A.B.; Fox, R.L.; Mulac, A.J. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 4p. (CONF-810812—1). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

In this paper the concept and goals of the DOE program, DEEP STEAM, as related to the development of a downhole steam generator for deep heavy oil recovery will be discussed. Additionally, the past, present and future activities of the development program being carried out at Sandia National Laboratories will be discussed. These include evaluation studies, surface testing at Bakersfield, CA, a run-in test at Hobbs, NM, and status of field testing at Long Beach, CA. The Long Beach test includes both a downhole diesel-air generator and a surface diesel-oxygen generator. 7 figures.

25036 **Single CO_2 injection well minitest in a low-permeability eastern carbonate reservoir--a preliminary report.** Watts, R.J.; Gehr, J.A.; Wasson, J.A.; Evans, D.M.; Locke, C.D. (US DOE, USA). *Society of Petroleum Engineers of A.I.M.E. (American Institute of Mining, Metallurgical and Petroleum Engineers), Paper ;* No. 9430, vp(1980). (CONF-800931—).

The objectives of the project were to determine the feasibility of injecting carbon dioxide into a low permeability reservoir to increase oil production and to obtain first-hand field experience with the CO_2 displacement process, problems, etc. The information and experience gained should be of value in the design of future EOR projects utilizing CO/sub 2/ as the displacing medium. 5 refs.

25037 **Granny's Creek CO_2 injection project, clay county, west virginia.** Conner, W.D. (Columbia Gas Transm Corp). pp v of Society of Petroleum Engineers-AIME east regional meeting. Dallas, TX; Society of Petroleum Engineers (1979).

From Society of Petroleum Engineers east regional meeting; Charleston, WV, USA (31 Oct 1979).

Columbia Gas Transmission Corporation, in conjunction with the Department of Energy, is conducting a field demonstra-

tion of oil recovery by CO_2 injection in Clay County, West Virginia. The objective of this test is to evaluate and demonstrate the effectiveness of using CO_2 injection to recover high gravity crude oil from shallow watered-out reservoirs. This paper reviews the project to date and describes the progress to date of the "mini-flood".

0204 Processing

25038 (ANL/CNSV—10) Energy and materials flows in petroleum refining. Gaines, L.L.; Wolsky, A.M. (Argonne National Lab., IL (USA)). Feb 1981. Contract W-31-109-ENG-38. 159p. NTIS, PC A08/MF A01. Order Number DE81024484.

The total energy consumed by petroleum refining is approximately 3 quads, making refining the largest industrial use of energy. United States refineries processed 13.5 x 10^6 bbl/d of crude oil in 1980, about 39% of which was imported. Refinery processes, which separate and transform crude into desired end products, consume - mostly for separation - about 10% of the energy content of the crude, taking 23% of this energy for crude distillation, 31% for cracking and fractionation, 11% for reforming and fractionation, and 6% for alkylation and fractionation. The last three of these processes are primarily designed to increase yield of gasoline, which makes up 42% of refined product volume. Lubricating products constitute only 1% of product volume, but their manufacture, being energy intensive, consumes 8% of total refinery energy. Lubricating oils are unusual among refinery products in that they can be recycled, as can asphalt, and some chemicals and polymers derived from petroleum. Several straightforward process modifications could reduce refinery energy consumption as much as 20%. Further reductions in energy use would require development of new processes, such as alternatives to distillation. Shale oil, coal, and biomass are possible substitutes for petroleum in the long term.

25039 (DOE/BETC/IC—80/3(Vol.4), pp 13p, Paper 15) **Effect of enhanced oil recovery chemicals on crude refining, 1979-1980.** Malloy, T.P.; Brubaker, I.; Hilfman, L. (UOP Inc., Des Plaines, IL). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

UOP Inc., with the support of the Department of Energy, is conducting research on the processability of EOR crude oil. In general, all experiments to date have shown that the surfactant (excluding the ethoxy sulfate) present in the produced EOR crude or surfactant doped crude oil survives distillation and is not recovered in any of the overhead fractions. It is concentrated in the vacuum resid. This experience was noted in laboratory and pilot plant distillations. The presence of surfactant did not seem to alter the fractionation or present any operational problems during the course of the distillations. Preliminary processing studies of the vacuum resids from Cities Service crude oil with and without doped Shell surfactant package have demonstrated a serious loss of catalyst activity for the surfactant package containing resid over that observed for the virgin resid. Concomitant with the loss of catalyst activity is the increase in surfactant concentration over time in the processed effluent further indicating catalyst degradation.

0206 Health And Safety

25040 (DOE/BETC/IC—80/3(Vol.1), pp 6p, Paper 20) **Toxicity of chemical compounds used in enhanced oil recovery.** Silvestro, E.; Desmarais, A.M. (Energy Resources Co. Inc., Cambridge, MA). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

Energy Resources Co. Inc. conducted an informational survey to assess the toxicological nature of chemical compounds used in Enhanced Oil Recovery (EOR) technologies so that the Department of Energy (DOE) can delineate possible constraints to EOR commercialization that the toxicity of these substances could pose. Initially, over 200 chemicals were surveyed, and approximately 50 chemical compounds or groups of compounds were selected for more intensive review on the basis of the extent of their use in current EOR field tests. Long-term environmental effects of EOR are not addressed in this document but the possibility of impacts due to the toxic properties of certain chemicals are discussed briefly in the research recommendations.

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 24969, 25626, 25633

25041 (DOE/PE/70278—T14) Outer-continental shelf oil and gas leasing policy. Davidson, V.A. (Harvard Univ., Cambridge, MA (USA). John Fitzgerald Kennedy School of Government). 13 Apr 1981. Contract AC01-80PE70278. 108p. NTIS, PC A06/MF A01. Order Number DE81025169.

With the potential for disruption of oil imports from the Persian Gulf associated with political instability in the region, the Department of Energy is interested in encouraging production of oil from all domestic sources. The unleased regions of the OCS are a major untapped source of domestic oil. Estimates of undiscovered oil resources vary from 67 to 300 billion barrels of oil and natural gas liquids offshore to water depths of 200 meters. Therefore, the Office of Oil Policy in DOE is concerned that the government process for leasing OCS tracts encourages production of these reserves. The purpose of this analysis is to determine if the current leasing process impedes timely resource development. In addition, the current lease sale process will be evaluated to determine if changes in the process might result in more efficient development of OCS reserves without endangering the environment and concurrent with ensuring fair market value to the public. Also, changes in the bidding systems involved in allocation of leases to firms will be evaluated. Section 1 describes the extent of resources in the Outer-Continental Shelf, the current leasing process, and the goals of the leasing process. Section II evaluates recommendations which may lead to improvements in OCS resource development.

25042 (PB—81-117160) Reducing the impact of margin ceilings on gasoline wholesalers. Final report. Bos, P.; Dewan, D. (Resource Planning Associates, Inc., Washington, DC (USA)). Dec 1979. Contract SBA-2632-OA-79. 73p. NTIS, PC A04/MF A01.

Report examines the effects of the margin ceilings on wholesalers' economic viability and recommends any necessary changes in the ceilings. The wholesale gasoline industry and the regulatory environment in which it operates is briefly described.

0208 Waste Management

25043 (DOE/BETC/IC—80/3(Vol.4), pp 5p, Paper 9) **Used oil recycling.** Brinkman, D.W.; Reynolds, J.W.; Goetzinger, J.W.; Cotton, F.O.; Steele, G.L. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

The research on used oil recycling this year has included not only characterization of feedstocks and products and development of new technology, but also generation of information on uses for rerefining by-products, documentation of the current recycling potential of a wide variety of lubricants, and initiation of many specialized efforts aimed at answering specific problems plaguing rerefiners. Because of the specialized nature of much of the work, most of the efforts were contracted out and two appear in separate reports by the contractors following this section.

25044 (DOE/BETC/IC—80/3(Vol.4), pp 9p, Paper 10) **Enhanced utilization of used lubricating oil recycling process by-products.** Weinstein, K.D. (Booz-Allen and Hamilton, Inc., Bethesda, MD); Myers, T.D.; Craft, S.R. 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

Booz, Allen and Hamilton, Inc., and its subcontractor, Chromaspec Corporation are conducting a study of possible utilization options for the process by-products generated in the re-refining of used lubrication oils. The study is taking place over a sixteen-month period which began in October, 1979. By-product samples from

five re-refineries utilizing three re-refining processes have been taken. Detailed physical and chemical characterization data on the sample streams and their components were compiled by means of detailed laboratory testing. Given the characteristics of the various streams and pertinent regulations which impact possible uses, several options for utilization of the by-product streams were derived. The apparently feasible options will go through several levels of engineering feasibility testing to determine levels and range of applicability.

25045 (DOE/BETC/IC—80/3(Vol.4), pp 4p, Paper 14) **Engineering design of a solvent treatment/distillation used lubricating oil re-refinery.** Savrick, M.D. (Stubbs Overbeck and Associates, Houston, TX). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

Drawings and specifications were prepared for a 10 million gallon per year used lubricating oil re-refinery based on the solvent treatment/distillation process developed and patented by the Department of Energy's Bartlesville Energy Technology Center. In addition, flowsheets were developed for facilities to treat 2, 5 and 20 million gallons per year. Using these drawings and specifications, a detailed capital cost estimate was prepared for the 10 million gallon facilities. Prorated estimates were derived for the other three capacities. The estimated capital costs (late 1979) for each facility are: 2 million gallon/year, $3,850,000; 5 million gallon/year, $4,550,000; 10 million gallon/year, $5,150,000; and 20 million gallon/year, $6,850,000. These estimates are based on a hypothetical siting with conditions similar to Houston, Texas. Major support facilities are included but the estimates do not include working capital, land or site preparation.

25046 **(DOE/BETC/RI—81/1) Application of the BETC re-refining technology to some state-of-the-art commercial lube oils.** Reynolds, J.W.; Brinkman, D. (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). Jul 1981. 14p. NTIS, PC A02/MF A01. Order Number DE81024428.

Five new lubricating oils of the extended drain and/or friction modified-type were charged to vehicles and used. The segregated drainings from each oil were re-refined by the solvent treatment/distillation process developed by the Bartlesville Energy Technology Center. The solvent treatment step of this process failed to desludge these oils significantly, indicating high levels of active dispersant additives remaining in the oils because of insufficient use. The overall process was successful, however, in producing re-refined basestocks of apparent high quality from the used oils. Thus, it would appear that direct distillation without pretreatment would have been adequate for these segregated samples.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 26396

25047 (DOE/BETC/IC—80/3(Vol.1), pp 7p, Paper 19) **Environmental aspects and fluid flow characteristics of EOR systems.** Crocker, M.; Marchin, L.; Kayser, M. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

To fully comprehend the long range effects of the chemicals used in EOR, BETC has begun research in the area of environmental technology. The specific objectives included in this research are: (1) obtain sufficient knowledge of the adsorption/desorption properties of EOR chemicals in a subsurface environment to enable the long-term chromatographic calculations of the migration patterns of the compounds, (2) determine the rates and products of natural chemical degradation of the EOR chemicals in order to evaluate the ultimate fate of the compounds, and (3) determine the three-phase transport properties of fluids in the subsurface to adequately predict the migration pattern of newer EOR fluids that involve the simultaneous flow of three immiscible fluids and to optimize recovery from these types of systems.

0210 Legislation And Regulation

REFER ALSO TO CITATION(S) 25031, 25633, 25634, 26172

0220 Transport, Pipelines, And Handling

25048 **(PB—81-105033) National petroleum reserve - Alaska: marine transportation system analysis. Executive summary.** Macpherson, M.D. (McMullen (John J.) Associates, Inc., New York (USA)). Oct 1980. Contract DO-A01-78-00-3082. 25p. NTIS, PC A02/MF A01.

This report presents a comprehensive parametric analysis of a number of concepts for the marine transportation of crude oil and gas from the national petroleum reserve in the Alaskan Arctic (NPR-A) to the contiguous United States. The analysis provides the transportation costs for icebreaking and ice-strengthened surface tankers and LNG carriers over a range of ship sizes and propulsion power levels and for submarine tankers for each of a number of routes from four loading ports in the Arctic to discharge ports on the East and Gulf Coasts of the United States. The report includes discussions of the technical factors related to Arctic ship construction and operation, ice technology, and the environmental and institutional factors which must be included in an evaluation of an Arctic marine transportation system.

25049 **(PB—81-105041) National petroleum reserve - Alaska: marine transportation system analysis. Final report.** Macpherson, M.D. (McMullen (John J.) Associates, Inc., New York (USA)). Oct 1980. Contract DO-A01-78-00-3082. 486p. NTIS, PC A21/MF A01.

This report presents a comprehensive parametric analysis of a number of concepts for the marine transportation of crude oil and gas from the national petroleum reserve in the Alaskan Arctic (NPR-A) to the contiguous United States. The analysis provides the transportation costs for icebreaking and ice-strengthened surface tankers and LNG carriers over a range of ship sizes and propulsion power levels and for submarine tankers for each of a number of routes from four loading ports in the Arctic to discharge ports on the East and Gulf Coasts of the United States. The report includes discussions of the technical factors related to Arctic ship construction and operation, ice technology, and the environmental and institutional factors which must be included in an evaluation of an Arctic marine transportation system.

25050 **Electrostatic coalescence system with independent ac and dc hydrophilic electrodes.** Henry, J.D.; Hovarongkura, A.D. (to Department of Energy). US Patent 4,252,631. 24 Feb 1981. Filed date 9 Jan 1980. vp.

PAT-APPL-110738.

An improved electrostatic coalescence system is provided in which independent ac and dc hydrophilic electrodes are employed to provide more complete dehydration of an oil emulsion. The ac field is produced between an ac electrode array and the water-oil interface wherein the ac electrode array is positioned parallel to the interface which acts as a grounded electrode. The emulsion is introduced into the ac field in an evenly distributed manner at the interface. The ac field promotes drop-drop and drop interface coalescence of the water phase in the entering emulsion. The continuous oil phase passes upward through the perforated ac electrode array and enters a strong dc field produced between closely spaced dc electrodes in which small dispersed droplets of water entrained in the continuous phase are removed primarily by collection at hydrophilic dc electrodes. Large droplets of water collected by the electrodes migrate downward through the ac electrode array to the interface. All phase separation mechanisms are utilized to accomplish more complete phase separation.

0230 Properties

REFER ALSO TO CITATION(S) 25013, 25027, 25039, 25891, 25972

25051 (AD-A—090129) Investigation of fire-vulnerability-reduction effectiveness of fire-resistant diesel fuel in armored vehicular fuel tanks. Final report 25 Sep 79-30 Sep 80. Wright, B.R.; Weatherford, W.D. Jr. (Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.). 30 Sep 1980. Contract DAAK70-79-C-0215. 41p. NTIS, PC A03/MF A01.

Laboratory flammability tests and bench-scale ballistic tests are described which have been used in the development of fire-resistant diesel fuel (FRF). These tests have indicated that FRF, at a bulk liquid temperature of 77 C, would be self extinguishing even if the flash point of its base fuel was less than 62 C. In order to confirm that this self-extinguishing property would prove effective in a realistic combat environment, arrangements were made for a series of tests to be conducted. These tests used 3.2-inch precision shaped charges fired through the armor and internally mounted fuel tanks of M48 battle tank and M113 armored personnel carrier hulks. AFLRL personnel participated in the planning and conducting of the tests, including all FRF blending. Results of the full-scale tests confirmed that residual burning can be eliminated by the use of FRF even though the mist fireball development is similar to that of neat fuel. Transient pressure effects are not affected by FRF, but sustained temperatures are drastically reduced by the FRF self-extinguishment.

25052 (DOE/BC/10043—25) Optimization of accelerated stability-test techniques for diesel fuels. Final report. Stavinoha, L.L. (Southwest Research Inst., San Antonio, TX (USA)). Jun 1981. Contract AC19-79BC10043. 68p. NTIS, PC A04/MF A01. Order Number DE81025707.

The purpose of this two-year project was to study the formation of deleterious products in middle distillate fuels; and, apply the results toward the development of more reliable test methods for fuel stability. During the first year for this program, eight accelerated stability tests were chosen and evaluated using a set of six test fuels. Correlations of accelerated stability test results were then related to test results obtained at a storage temperature of 43°C(110°F), which has generally been regarded as showing good correlation with long-term ambient storage. Overall, the stability data from the 43°C storage did not follow a trend which was directly predictable by any one of the other test methods; however, the data from an 80°C test served this purpose best. During the second year's effort, primary emphasis was placed on testing 43°C and 150°C tests which are being cooperatively developed by the American Society for Testing and Materials (ASTM). Testing of eight fuels having a wide range of stabilities provided data which, when mathematically correlated, allowed for a number of observations. Total insolubles, as opposed to total gum values, were judged to be more acceptable for data correlation in that total gum values could not be reliably corrected for initial gum values. In general, test results at 43°C, 80°C, 150°C, and ASTM D 2274 provided directional agreement. Vented versus nonvented storage at 43°C did not provide any evident biases related to test configurations at the 4-, 8-, 12-, 18-, and 24-week test intervals. Based on data generated, no significant bias could be found for bottle configuration in the 43°C test. In an effort to standardize the 43°C and 150°C tests, planning and cooperative testing was provided to ASTM Committee D-2, Technical Division E/V.

25053 (DOE/BETC/IC—80/3(Vol.2), pp 11p, Paper 13) **Studies of aqueous solutions and microemulsions for enhanced oil recovery processes.** Benton, W.J.; Mukherjee, S.; Qutubuddin, S.; Miller, C.A.; Fort, T. Jr. (Carnegie-Mellon Univ., Pittsburgh, PA). 1980. NTIS, PC A17/MF A01.

In Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980.

Aqueous surfactant solutions in the concentration range proposed for injection were studied by polarizing microscopy, polarized light screening, and viscometry. The former two techniques were applied mostly to pure surfactant systems during the past year. The results confirmed the generality of the pattern of liquid crystal structures reported previously for petroleum sulfonates. Viscometry showed that viscosity variations are closely related to these changes in structure. Phase behavior was determined for a range of compositions in a system containing a pure surfactant (Texas 1), n-propanol, n-decane, and NaCl brine. The results show that behavior is basically the same as in petroleum sulfonate systems. They also suggest a similarity in behavior between solutions with high and low surfactant concentrations, a matter which has been the subject of some previous controversy. Further studies of microemulsions using the ultracentrifuge provided additional confirmation of the mechanism of ultralow interfacial tensions proposed previously.

25054 (DOE/BETC/IC—80/3(Vol.4)) Processing and utilization. Annual report, October 1, 1979-September 30, 1980. Linville, B. (ed.). (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). 1980. 312p. NTIS, PC A14/MF A01.

Petroleum research in the Department of Energy, as exemplified in the Liquid Fossil Fuel Cycle (LFFC), includes processing and utilization research as well as extraction research. Consideration of the LFFC enables research to be effectively targeted toward those projects which will have greatest impact on the total energy use pattern. Thus a change in utilization fuel requirements may reduce processing requirements or make marginal resources more useful. Processing research is represented by 15 papers of which 8 are inhouse, 6 are contractors', and one is a joint paper. The contractors' papers are concerned with waste-oil re-refining (2), fuel stability (3), effect of EOR chemicals (1), and isotope-ratio measurement (joint). The in-house papers cover characterization, thermodynamics, and process technology. Utilization research is largely concerned with internal combustion engines and their fuel use. Fifteen papers, 11 in-house and 4 contractors', are included. The in-house papers relate to both the improvement of engine efficiency and the use of alternate fuels. The contractors' reports concern the use of coal-derived liquids in diesel engines and the analysis of gasolines commercially available. A third section deals with project integration and technology transfer. Six papers, all prepared by contractors, discuss aspects of the LFFC and project integration (3) and technology transfer (3). Thirty-four papers are indexed separately.

25055 (DOE/BETC/IC—80/3(Vol.4), pp 13p, Paper 1) **Geochemical characterization of petroleum using carbon, sulfur, hydrogen and nitrogen stable isotopes.** Brand, S.W. (Dept. of Energy, Bartlesville, OK); Chung, H.M.; Grizzle, P.L.; Kaplan, I.R.; Sweeney, R.E. 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

Approximately 1300 measurements of carbon, sulfur, hydrogen and nitrogen stable isotopes have been completed for crude oils, crude oil distillates, residuum and hydrocarbon compound-type fractions for samples from the Michigan and Los Angeles Basins. Meaningful correlations using these data and other chemical and physical properties have been developed. In the Michigan Basin, correlations indicate that the Devonian and Silurian reservoired oils are of unique and different origins. For the Devonian oils, correlations suggest the incorporation of isotopically heavy sulfur during catagenic processes. For the Silurian oils, sulfur was not found to be incorporated during this process. Stable isotope ratio data of hydrocarbon compound-type (Saturates, Monoaromatics, Diaromatics and Polyaromatic Polar) fractions indicate that these oils are derived from different original organic matter and demonstrate the isotopic fractionation processes associated with both petroleum formation and secondary alteration processes. Data for Los Angeles Basin oils have been received but data interpretation has not been completed.

25056 (DOE/BETC/IC—80/3(Vol.4), pp 17p, Paper 2) **Characterization of fossil liquids.** Dooley, J.E.; Woodward, P.W.; Grizzle, P.L.; Scheppele, S.E. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

The BETC Characterization Branch supports analytical chemistry requirements of the Center in the areas of routine analytical services, separation and chemistry research, and instrumentation research. During FY 80, analytical services have provided data for 50 new crude oils to be added to a data bank already consisting of some 9000 of these analyses. In addition, more than 1000 brine

analyses were performed; numerous nitrogen, sulfur, and other ASTM test results were obtained on samples under study; five API fuel survey reports were published; and regular monthly, semiannual, and annual fuel survey reports were prepared for ASTM. Characterization studies for petroleum heavy ends and syncrudes continued with progress being made on developing techniques for analyzing 535°C+ materials. Coal liquids from SRC II and HRI coal liquefaction processes are being studied to determine composition and provide support for pilot plant operations. Capabilities for HPLC, FI/FD mass spectrometry, and microprobe distillation mass spectrometry were added during the year. Other efforts in geochemical applications have resulted in the development of several relationships and correlations for crude oils from the Michigan, Big Horn, and Java Sea basins.

25057 (DOE/BETC/IC—80/3(Vol.4), pp 3p, Paper 3) **Micellar properties of oil and additives.** Good, W.D.; Dwiggins, C.W.; Doughty, D.A. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

Experimental measurements in small-angle x-ray scattering, ultracentrifugation and isopiestic distillation continued. Two papers of fundamental importance were published, and a third was written and submitted for publication.

25058 (DOE/BETC/IC—80/3(Vol.4), pp 4p, Paper 5) **Thermodynamics of organic compounds.** Good, W.D.; Smith, N.K.; Gammon, B.E.; Osborn, A.G. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

Precision oxygen-bomb combustion calorimetry gave values of the heats of combustion of three high-energy, high-density compounds that are components of candidate fuels for the cruise missile and of two compounds with high steric interactions that might be useful in tailoring high energy fuels of the future. Differential scanning calorimetry gave values of the heat capacity of two ramjet fuels that are in current use.

25059 (DOE/BETC/IC—80/3(Vol.4), pp 5p, Paper 7) **Thermodynamic properties of tertiary recovery systems.** Good, W.D.; Noll, L.A.; Burchfield, T.E. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

The system for acquisition and reduction of data has been thoroughly tested and is in routine use. Measurements in solution and adsorption microcalorimetry have continued. The digital densimeter and specific heat microcalorimeter are operating. Results are presented for solution calorimetry of sodium 2-dodecylbenzene sulfonate and adsorption calorimetry of 1-butanol.

25060 (DOE/BETC/IC—80/3(Vol.4), pp 15p, Paper 13) **Accelerated stability test techniques for middle distillate fuels.** Stavinoha, L.L.; Westbrook, S.R. (Southwest Research Inst., San Antonio, TX). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

Improved test techniques are needed for evaluating the inherent stability of middle distillate fuels both in surveillance and in procurement activities. A project was initiated to define and evaluate the contributing conditions leading to the formation of deleterious products in accelerated aging tests of middle distillate fuels and to relate these results to an experimental definition of more repeatable/reliable middle distillate fuel stability test techniques(s). A literature search was conducted to provide a list of stability test techniques and their interpretations which could be used in a correlative middle distillate fuel stability test program. For this program, seven accelerated stability tests were chosen and evaluated using a set of six test fuels. The test techniques were selected to represent a wide variety of test conditions including temperature, aging time, and oxygen availability. The six test fuels were purposely chosen to represent a wider range of stabilities than would necessarily be commonly available for procurement. The fuel properties generally measured included both adherent and suspended particulates, steam jet gum, color, and light absorbance at 540 nanometers. Accelerated stability test results were then related to test results obtained at a storage temperature of 43.3°C (110°F), which has generally been regarded as showing good correlation with long-term ambient storage. A second year effort was initiated to evaluate the ASTM-proposed Test for Distillate Fuel Storage Stability at 43.3°C(110°F) and the ASTM-proposed Standard Practice for High Temperature Stability of Distillate Fuels, as well as various other accelerated stability test techniques.

0240 Storage

REFER ALSO TO CITATION(S) 25052

0250 Combustion

REFER ALSO TO CITATION(S) 24958, 24961, 24966, 25446

25061 (EPRI-WS—80-127, pp 1.19-1.32) **Use of fuel additives in oil firing.** Krause, H.H. (Battelle Columbus Labs., OH). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

The most important problems which can be alleviated by additives in boilers fired with residual oil result from three chemical elements in the fuel: sulfur, vanadium, and sodium. These elements are present in all residual oils, but the amount of each varies over a fairly wide range, depending on the source of the oil. During the combustion process, most sulfur burns to SO_2. About 1% of this SO_2 is converted to SO_3, which in turn combines with water vapor in the flue gas to form sulfuric acid. The conversion of SO_2 to SO_3 can continue through the boiler as a result of catalytic action by iron and vanadium compounds. The vanadium in the oil is oxidized to V_2O_5, which may then react with the sodium and trace metals in the fuel to form metal vanadates. The sodium first forms Na_2O and then reacts with SO_3 and V_2O_5 to form Na_2SO_4 and/or a series of sodium vanadates. With the exception of Na_2SO_4, these products can all be causes of problems in the boiler. Utilities are using additives in oil-fired burners for a variety of purposes: SO_3 and acid smut control, superheat control, and avoidance of low-temperature corrosion. Overcoming either high- or low-temperature fouling and reducing plume visibility have been of less priority. MgO is effective in controlling most boiler problems. Manganese-based additives have been reported to be effective for many purposes, particularly high-temperature fouling and corrosion. Combinations of MgO with alumina or with manganese oxides also have been effective for several boiler problems.

25062 (EPRI-WS—80-127, pp 2.1-2.8) **High-temperature corrosion and fouling in oil-fired power plants.** Krause, H.H. (Battelle Columbus Labs., OH). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

Corrosion of superheater and reheater surfaces in oil-fired boilers is caused most frequently by deposits of low-melting-point sodium/vanadium compounds. Additives can convert these deposits to high-melting, noncorrosive compounds. Magnesium-based additives, with or without other metallic ingredients, are effective in reducing high-temperature corrosion. Magnesium generally is added as MgO dispersed in oil, but oil-soluble forms of magnesium and dry powders are used sometimes and found to be effective. Manganese-based additives and combinations of other metals in oil-soluble form also are reported to have been effective in some trials. Additives other than dry powders usually are introduced into the burner fuel lines, where they are metered continuously, but may be batch-blended before or during oil storage. Increased fouling of convective surfaces can occur with MgO additives if dose rates are too high. Liquid MgO additive dose rates from 2000:1 to 4000:1 v/v are commonly used; the Mg/V ratio is then about 1:1 for the fuels in question. Although the ash content of fuel oils generally is low, this ash may lead to serious fouling of superheater and reheater surfaces if the deposits are partially melted. Additives may be used to modify deposits to a form more easily removed by soot-blowing. Evidence from the literature shows that MgO + Al_2O_3 mixtures

are the most effective additives available to reduce fouling. Experience reported by utilities with MgO + Al_2O_3 additives is about equally divided between effective and ineffective. Utilities have found that Mn oxides, alone or in conjunction with MgO or Al_2O_3, also are effective against fouling. Little success has been obtained with additives for oil ash modification. Additives have been used primarily as oil dispersions introduced into fuel lines. Dosage rates for Mn-based additives generally have been lower than for those based on MgO and Al_2O_3.

25063 (EPRI-WS—80-127, pp 2.19-2.36) **CEGB experience with additive trials.** Dominey, D.A.; David, I.; Laxton, J.W. May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

The objective of the CEGB studies of additives has been to solve the problem of acid smut emission in a manner leading to a scientifically based understanding of the solution. The paper describes a series of trials which were mounted with oil-fired boilers ranging from 60 to 500 MWe. These trials were supported by wide-ranging plant and laboratory work and by theoretical studies. The additives tested included commercial products and industrial chemicals with a wide range of chemical and physical properties. The paper discusses the criteria selected to judge the results of the trials; summarizes the experimental methods used to measure the amount and acidity of deposits, the composition of the flue gas, and the extent of the emission; and presents some results. The solution to the smut-emission problem lies mainly in the efficient control and operation of the plant. The use of additives is an extra weapon available to the operator. As such, the equipment must be reliable and efficient and readily available for use. Much of the Board's development program was devoted to this objective.

25064 (EPRI-WS—80-127, pp 2.59-2.62) **Summary of the discussion-group sessions on high-temperature corrosion and fouling in oil-fired boilers.** Krause, H.H. (Battelle Columbus Labs., OH). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

The current state of knowledge regarding additives for high-temperature corrosion and fouling can be summarized as follows: (1) MgO is definitely effective for problems arising from vanadium and sulfur trioxide. (2) MgO + alumina is effective for high-temperature fouling problems. (3) Additive performance is site-specific, and experience in one boiler cannot be transferred directly to another unit. (4) The sodium-to-vanadium ratio in the fuel affects the additive performance. However, there are still unanswered questions regarding the use of additives in corrosion and fouling applications. Information is needed on: the critical value of the sodium-to-vanadium ratio in the fuel and the extent of additive treatment required; the effectiveness of manganese additives against corrosion and fouling; the extent of toxicity problems that may arise from the use of manganese additives; the surface-to-volume effects that occur with MgO additives; the possible effects of nickel in the fuel on the action of additives; and the most efficient test program procedures.

25065 (EPRI-WS—80-127, pp 2.65-2.69) **Summary of discussion group sessions on back-end corrosion and acid emissions by oil-fired boilers.** Dooley, R.B. (Ontario Hydro, Toronto). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

The discussion groups dealt basically with the problems of SO_3 generation in the furnace envelope together with the possibility of some catalytic reaction on high-temperature tube surfaces. These effects could cause the deposition of H_2SO_4 onto cooled surfaces and the associated problems of corrosion, fouling, and acid smut release. There was little enthusiasm expressed for gaining further understanding of the basic phenomena, although it was recognized that proper selection and assessment of an additive is dependent somewhat on these mechanisms. Concern also was directed at plume opacity problems resulting from H_2SO_4 mists or aerosols. The discussions were directed essentially at the subjects enumerated in this summary and attempted to define areas of deficient knowledge and/or topics to which the utilities considered that useful research work could be directed, either in the laboratory or in field trials.

03 NATURAL GAS

25066 **(PB—81-114258) Energy/economic model analysis. Macroeconomic impacts of research and development in gas supply and end use technologies. Final report.** Goettle, R.J. IV; Hudson, E.A. (Jorgenson (Dale W.) Associates, Cambridge, MA (USA)). Jun 1980. Contract GRI-5014-310-0201. 73p. NTIS, PC A04/MF A01.

The Gas Research Institute (GRI) needs to consider the economic impact of the various technologies whose research and development is supported by GRI funding. Previous analysis indicated that three energy-economic models would be useful for such a technology assessment. These models are: Energy Economic Modeling System (EEMS) developed by Decision Focus, Inc. (DFI), Energy Policy Model (EPM) developed by Lawrence Livermore Laboratory (LLL), Time-Stepped Energy System Optimization/Long Term Inter-Industry Transaction Model (TESOM/LITM) developed by Brookhaven National Laboratory (BNL) and Dale Jorgensen Associates. The study used these three models to help in the economic impact evaluation of various GRI research and development (RandD) programs.

0301 Reserves

25067 **(MLM—2831(OP)) Resource assessment of the eastern gas shales.** Zielinski, R.E.; McIver, R.D.; Komar, C.A. (Mound Facility, Miamisburg, OH (USA); McIver Consultants International, Houston, TX (USA); Department of Energy, Morgantown, WV (USA). Morgantown Energy Technology Center). 1981. Contract AC04-76DP00053. 25p. (CONF-810814—2). NTIS, PC A02/MF A01.

From 91. national meeting of the American Institute of Chemical Engineers; Detroit, MI, USA (16 Aug 1981).

The Upper Devonian shales of the Illinois, Appalachian and Michigan Basins are being characterized to provide a basis for accelerating the exploitation of this unconventional source of natural gas which contains in its matrix enormous quantities of natural gas. The Eastern Gas Shale Program is being conducted in order to provide industry with criteria for locating the best areas in which to drill and the means for effectively stimulating the shale to make wells drilled in this resource economically attractive. This paper deals with the organic geochemical characterization of the shales and those criteria that have evolved to assist in the exploration of the resource.

0302 Geology And Exploration

25068 **(DOE/MC/10389—T1) Evaluation of Devonian shale potential in West Virginia.** (Tetra Tech, Inc., Columbus, OH (USA)). 1981. Contract AC21-79MC10389. 130p. (DOE/METC—120). NTIS, PC A07/MF A01.

In West Virginia, all significant areas of current Devonian shale gas production are situated where the radioactive shale units are thicker than 200 feet. Most areas of current gas production exhibit a close correlation with the trend of the Rome trough structure, and nearly all lie within the optimum stress-ratio zone. In addition, most of the current gas-producing areas are located within the zone of optimum shale thermal maturity, and optimum shale thermal maturity nearly coincides with the optimum shale stress-ratio value (0.43) in western and southwestern West Virginia. Areas adjacent to existing gas fields, within northeastern Cabell County, northern Lincoln County, and central Wayne County, are excellent prospects for future production. Additional deeper drilling in existing gas fields within the main trend may tap potential new reservoirs in the Rhinestreet and Marcellus Shales. The area east of the Warfield anticline in central Boone, Logan, and eastern Mingo Counties also may be favorable for gas exploitation of the radioactive Huron Shale. Fractures associated with the flank of the anticline and possible reactivation of basement faults in this area should be sufficient to provide the means for production. Further drilling should also be conducted along extensions of the border fault zone of the Rome trough in the western portion of the state. However, the subsurface trend of the trough must be carefully delineated to successfully develop gas production from potential fractured reservoir systems.

0303 Drilling, Production, And Processing

REFER ALSO TO CITATION(S) 24944, 24990, 24994, 26404

25069 Fuel gas desulfurization. Shen, M.; Yang, R.T. (to Department of Energy). US Patent 4,252,778. 24 Feb 1981. Filed date 21 Dec 1978. vp.

PAT-APPL-972156.

A method for removing sulfurous gases such as H_2S and COS from a fuel gas is disclosed wherein limestone particulates containing iron sulfide provide catalytic absorption of the H_2S and COS by the limestone. The method is effective at temperatures of 400°C to 700°C.

25070 Evaluation of gas-bearing coal seams. Rieke, H.H. III; Rightmire, C.T.; Fertl, W.H. (TRW, USA). *Journal of Petroleum Technology ;* **33**: No. 1, 195-204(Jan 1981).

A discussion is presented of test activities and results from four selected wells used to acquire coalbed methane data in the Illinois, Piceance, Arkoma, and Green River basins. Techniques used to evaluate the coalbed gas resource are well logging, conventional and sidewall coring, gas desorption of the coal cores, and drillstem testing. Experience gained by employing these techniques is presented. 10 refs.

0305 Health And Safety

REFER ALSO TO CITATION(S) 25078

25071 (PB—81-113292) Initiation of detonation in unconfined natural gas-air clouds. Final report. Nicholls, J.A.; Sichel, M. (Michigan Univ., Ann Arbor (USA). Gas Dynamics Labs.). May 1980. Contract GRI-5014-363-0132. 42p. NTIS, PC A03/MF A01.

There has been concern as to whether an unconfined combustible cloud arising from the release of liquefied natural gas could detonate. Accordingly, a laboratory scale experimental program and accompanying theoretical treatment were initiated to evaluate this possibility. A sector of a cylindrical cloud was modeled by a special shock tube. Blast waves of variable strength were transmitted into the combustible mixture of interest. Since methane-air couldn't be detonated, the critical initiation energy requirements for various stoichiometric methane-oxygen-nitrogen mixtures were determined and then extrapolated to determine the value for methane-air. Extremely high values were indicated. Inasmuch as natural gas commonly contains ethane and/or propane, stoichiometric mixtures containing various percentages of these gases were tested. Small additions of either (but ethane moreso than propane) reduced the critical initiation energy appreciably, although the values were still quite high. The analytical study shed much light on the competing chemical kinetic and gas dynamic processes. The analysis allowed planar, cylindrical, and spherical geometries to be considered. Further, it independently predicted the characteristics observed experimentally, thus supporting the experimental results.

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 25626

25072 Economic analysis of foam fracturing in the Devonian shales: preliminary report. Liebenthal, A.M.; Komar, C.; Rieke, H.H.; Skillern, C.R. (TRW, USA). pp v of Society of Petroleum Engineers-AIME east regional meeting. Dallas, TX; Society of Petroleum Engineers (1979).

From Society of Petroleum Engineers east regional meeting; Charleston, WV, USA (31 Oct 1979).

The Department of Energy's Morgantown Energy Technology Center (DOE-METC) has, since 1975, been sponsoring a number of foam fracturing stimulation treatments in the Devonian Shale. This paper presents a preliminary economic analysis of these foam treatments. It uses a discounted cash flow method and generalized production decline curves based on actual production data from 25 hydraulically fractured wells in the Devonian Shale (Big Sandy region) of Eastern Kentucky. The results of the study show that gas production from foam fraced wells is economically viable if the resulting production decline curve is similar to that of hydraulicallay fractured wells with the same initial open flow rates. 14 refs.

25073 (UT/CES-PS—15) Preliminary analysis of the natural gas market-ordering problem. Means, R.C. (Texas Univ., Austin (USA). Center for Energy Studies). Feb 1981. 132p. NTIS, PC A07/MF A01. Order Number DE81903427.

Under the terms of the Natural Gas Policy Act of 1978, federal price controls will be removed from more than half of the nation's natural gas supply on January 1, 1985. The present study analyzes the possible consequences of this partial deregulation. One consequence almost certainly will be a large increase in the price paid by natural gas consumers throughout the country. A second will be an especially large increase for customers of pipelines controlling relatively little natural gas still subject to proce controls; these pipelines include the intrastate pipelines that serve the major gas-producing states but also some of the interstate pipelines. The price paid by customers of these pipelines will reflect the full unregulated field price of natural gas, while for customers of some of the interstate pipelines the price of unregulated gas will be averaged with the much lower price of substantial quantities of price regulated gas. This disparity may lead in turn to a third consequence of partial deregulation: a large shift of natural gas supplies from intrastate to interstate pipelines and also between interstate pipelines.

0308 Environmental Effects

REFER ALSO TO CITATION(S) 25078

0320 Transport, Pipelines, And Handling

REFER ALSO TO CITATION(S) 25048, 25049

25074 Compressor station noise-abatement: a case study. Bianucci, J.A.; Bush, R.C.; Dooher, C.A. San Francisco, CA; Pacific Gas and Electric Company (1980). 25p. (CONF-8003142—7).

From Pacific Coast Gas Association operating section transmission conference; Salt Lake City, UT, USA (31 Mar 1980).

This paper describes the noise abatement measures incorporated by Pacific Gas and Electric Company into the design of its Brannan Island Compressor Station. This two unit reciprocating compressor station is located within 100 feet of a state park and 600 feet of a camp site. Operating noise level data is presented and compared to design expectations.

25075 (GESP—813) Pipeline bottoming-cycle study: operational reliability and maintainability assessment. (General Electric Co., Cincinnati, OH (USA). Space Div.). 30 Mar 1979. Contract AC03-77CS51381. 23p. NTIS, PC A02/MF A01.

The Pipeline Bottoming Cycle Study deals with the applications of Rankine bottoming cycle systems to gas compressor stations in gas pipelines. To evaluate these systems, three potential sites were examined and preliminary engineering studies conducted for each. The goal in each case was to demonstrate the economic and technological viability of the system. The potential for fuel savings was of primary importance. To insure that no major barriers to commercialization of the bottoming cycles system exist, various assessments were conducted. The Operational Reliability and Maintainability Assessment is contained in this report. The general conclusion is that a highly reliable bottoming cycle system requiring a minimum of maintenance can be designed and installed at many of the nation's pipeline pumping stations to conserve energy. The system reliability and maintainability are influenced by the type of gas turbine and the particular site (i.e., pumping station) to which the bottoming cycle system is applied. The bottoming cycle system working fluid can also have a major effect on the system maintainability. This report recommends that alternate fluids be studied in an attempt to find a more acceptable (less hazardous) fluid than toluene.

25076 **(PB—81-115123) Quarterly report no. 5 to the President and Congress on the construction of the Alaska Natural Gas Transportation System.** (Office of the Federal Inspector for the Alaska Natural Gas Transportation System, Washington, DC (USA)). Oct 1980. 23p. NTIS, PC A02/MF A01.

The items discussed in this report have been selected to provide an accurate, overall picture of the recent progress on the Alaska Natural Gas Transportation System (ANGTS). Only significant developments occurring during the third quarter of Calendar Year 1980 are discussed.

25077 **Field method for determining pulsation in orifice meters.** Vahlstrom, T.C. San Mateo, CA; Pacific Coast Gas Association (1980). 34p. (CONF-8003142—4).

From Pacific Coast Gas Association operating section transmission conference; Salt Lake City, UT, USA (31 Mar 1980).

Those in the natural gas industry who are responsible for orifice meter measurement have no doubt encountered the problem of compressor pulsation. It has long been known that any orifice meter subjected to pulsating flow will record erratically and most probably erroneously. The actual effect depends on the physical characteristics of the pulsation. Because pulsation errors can exist without any telltale indicators on an orifice chart recording, many pulsation errors remain undetected and uncorrected. Many causes, especially reciprocating compressors, are responsible for creating pulsation. This paper presents a simple and inexpensive method for detecting the presence of pulsation, estimating its effect on orifice meter accuracy, and correcting it, regardless of the source of the pulsation.

0330 Properties

25078 **(DOE/TIC—11452) Study of gelled LNG.** Rudnicki, M.I.; Cabeal, J.A.; Hoffman, L.C.; Newton, R.A.; Schaplowsky, R.K.; Vander Wall, E.M. (Aerojet Energy Conversion Co., Sacramento, CA (USA)). May 1981. Contract AC03-80SF10846. 110p. NTIS, PC A06/MF A01. Order Number DE81023259.

This research included (1) further characterization of gelled LNG (GELNG) rheological properties, (2) assessment of the relative leakage of GELNG vs LNG through a perforated wall, (3) relative spread and vaporization rates of unconfined spills on water, and (4) relative spread and vaporization rates of unconfined spills on land. Shear stress vs strain rate was determined for a range of gelant concentrations. The shear diagram was extended to cover shear rates in the range of 13 to 14,800 inverse seconds, expanding previous results at both low and high shear rates. Leakage tests of GELNG through a known geometry perforation were conducted along with comparative testing with LNG. Rapid cessation of flow through the perforated plate was observed for all tested concentrations of GELNG and at all driving pressures. This cessation of leakage was observed for both moist ambient air and dry helium isothermal environments. LNG showed no flow cessation tendencies under any of the test conditions. Land spills were found to give inconclusive results due to difficulties in measuring transient weight changes during the spill. Water spills were conducted in such a way that spread areas could be photographically recorded. Gelation increases total vaporization time significantly in water spills.

25079 **(UCID—19000) Flame propagation in gaseous fuel mixtures in semiconfined geometries.** Urtiew, P.A. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 7 Apr 1981. Contract W-7405-ENG-48. 37p. NTIS, PC A03/MF A01. Order Number DE81025115.

The possible hazardous consequences of large spills of liquefied natural gas (LNG) are not completely known at present, but research into the problem is advancing steadily. Here we review previous work on flame propagation in gaseous fuels contained in semiconfined geometries. We formulate our present understanding of the phenomena involved, describing some of the parameters that may have an effect on flame propagation, flame acceleration, and the transition from deflagration to detonation. We describe some of our recent experiments on combustion in semiconfined geometries. Our results suggest that turbulence-producing obstacles in the flow path are the primary cause of acceleration of the flame front. Other parameters remain to be investigated, however, before we can give a satisfactory explanation of flame acceleration.

0340 Combustion

REFER ALSO TO CITATION(S) 25071

04 OIL SHALES AND TAR SANDS

0401 Reserves And Exploration

REFER ALSO TO CITATION(S) 25081

0403 Drilling, Fracturing, And Mining

25080 **(LA-UR—81-1659) Calculations of cratering experiments with the bedded crack model.** Margolin, L.G. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810684—32). NTIS, PC A02/MF A01. Order Number DE81025290.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

The physical models upon which the BCM (bedded crack model) is based are described. Calculations of a cratering event in the Colony Oil Shale mine in Colorado are presented. The process of crater formation is outlined based on computer simulations. The BCM is a statistical model which describes fracture in terms of the growth of microcracks. (DMC)

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 24975

25081 (DOE/BETC/IC—80/3(Vol.1), pp 8p, Paper 29) **US Department of Energy-Fossil Energy Laramie Energy Technology Center tar sand research and development program, FY 1980.** Marchant, L.C.; Johnson, L.A.; Dorrence, S.M. (Dept. of Energy, Laramie, WY). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

As the Lead Center for Tar Sand Research and Development in the US Department of Energy Enhanced Oil Recovery Program, the Laramie Energy Technology Center (LETC) is conducting field and laboratory experimentation in the advancement of tar sand recovery technologies towards commercialization of United States Tar Sand resources. Activities in the program during FY 1980 addressed the implementation of six major program areas: Planning and Management, Resource Assessment, Reservoir Access, Recovery, Preparation, and Environment.

25082 (DOE/BETC/IC—80/3(Vol.1), pp 4p, Paper 30) **Steam injection test in the Northwest Asphalt Ridge tar sand deposit near Vernal, Utah.** Fahy, L.J.; Romanowski, L.J. Jr. (Dept. of Energy, Laramie, WY). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

The design of the first Laramie Energy Technology Center steam injection test in tar sand, LETC TS-1S, began in late FY79 and was completed by January 1980. Following completion of construction in April 1980, steam injection was initiated in the center well of two concentric inverted five spot patterns. The zone chosen for testing was a 50-ft-thick sandstone in the Rim Rock member of the Mesaverde Formation containing a 14°API bitumen with a viscosity of at least 10^6 centipoise at reservoir conditions and at an average saturation of 78.9 percent pore volume. To date, 36,000 barrels of water equivalent steam has been injected at 400 to 450 psig and 350 to 400 bpd and in excess of 700 barrels oil and 4700 barrels of water has been produced. Injection and production will continue through September 1980 with detailed analysis of the products and process to follow.

25083 **(DOE/CH/90035—4) rf heating of Utah tar sands. Final report, October 1978-December 1979.** Bridges, J.; Sresty, G.; Taflove, A.; Genge, M.; Snow, R.; Kornfeld, J. (IIT Research Inst., Chicago, IL (USA)). Jan 1980. Contract AT02-76CH90035. 230p. NTIS, PC A11/MF A01. Order Number DE81024988.

The rf process recovers oil from tar sands in two steps: the deposit is first volumetrically heated with radio frequency (rf) energy to lower the viscosity of the bitumen; the bitumen is then retrieved by one of several petroleum recovery methods. The rf heating is accomplished by inserting tubular electrodes into boreholes and energizing them with an rf power source. The electrical properties of Utah tar sands were found to behave as those of heterogeneous dielectrics, with parameters varying with moisture content. Electrical breakdown thresholds proved to be in excess of 10^5 V/m - order of magnitude above expected operating levels. Although the electrical parameters varied with temperature during heating, they behaved well enough to make possible efficient matching of power into the deposit. Analytical and experimental studies - including rf heating of 150 to 230 kg blocks of tar sand or loose clay - demonstrated that nearly uniform heating is possible. Laboratory tests on samples as large as 250 kg demonstrated that under ideal conditions up to 85% of the bitumen could be recovered by fluid replacement (tertiary) recovery methods. Based on computer simulation, very high recovery rates could be realized by gravity drive in combination with the electrodes which also serve as production wells. According to analytical studies, the process produces four to ten times more energy than it consumes. The actual value depends on the richness of the deposit, the characteristics of the oil and the rock, and the overall recovery. Costs were assessed for an rf site development plan to produce 10^4 bbl/day from a medium rich 20m thick, 150m deep Utah tar sand deposit. Total costs were assessed, exclusive of prerefining, to be in the order of 5.50 $/bbl for a 70% recovery.

25084 **(DOE/R4/10185—T1) Synthetic fuels from eastern oil shale. Final report.** Vyas, K.C.; Aho, G.D.; Robl, T.L. (Buffalo Trace Area Development District, Maysville, KY (USA); McKee (Davy) Corp., Cleveland, OH (USA); Cleveland-Cliffs Iron Co., Rifle, CO (USA); Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research). Jan 1981. Contract FG44-80R410185. 439p. NTIS, PC A21/MF A01. Order Number DE81024274.

The main objectives of this study were to make a resource assessment, a mining study and a process economic evaluation of oil shale in Lewis and Fleming Counties, Kentucky. Two surface retorting processes, Paraho and HYTORT, were selected and the process and economic analyses were made for a 30,000 tons/day oil shale retorting facility. The results of this investigation are presented in this report.

25085 **(PB—81-114092) Hydrogasification of oil shale. Final report Jan 72-Dec 79.** Feldkirchner, H.L. (Institute of Gas Technology, Chicago, IL (USA)). Oct 1980. Contract GRI-5014-332-0138. 495p. NTIS, PC A21/MF A01.

The goal of this study was to investigate the technical and economic feasibility of producing synthetic pipeline gas from oil shale using the HYTORT Process. The technical and economic feasibility of the process was shown in laboratory-scale, bench-scale, and PDU-scale (1-ton/hr process development unit) equipment in tests with both Eastern and Western U.S. shales. With Western shales, 95% or more of the organic carbon could be converted to useful products, and with Eastern shales organic carbon conversions up to 90% were achieved. In addition to showing the overall technical and economic feasibility of the process, this study showed the technical and economic feasibility of a novel, patented method for feeding shale to and from high-pressure reactors. Based on the results obtained, it now appears that the Eastern U.S. shale resource (largely neglected in the past because of the low yield by the conventional Fischer Assay method) is now economically recoverable.

25086 **(UCID—19082) Oil shale project run summary, small retort runs S-21 and S-23.** Raley, J.H.; Campbell, J.H. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 22 Jun 1981. Contract W-7405-ENG-48. 131p. NTIS, PC A07/MF A01. Order Number DE81026035.

The objective of Runs S-21 and S-23 was to assess the technical feasibility of using oxygen diluted, respectively, with steam or carbon dioxide as the injection gas for MIS oil shale retorting. The motivation for using oxygen rather than air is the production of a much higher value offgas. In contrast to the nitrogen diluent present in air, steam and CO_2 can be removed readily, by condensation or absorption, from the valuable hydrocarbon and hydrogen species in the offgas. Furthermore, steam enhances hydrogen production and, coupled with the steam condensation, could result in offgas hydrogen concentrations sufficient to warrant recovery of hydrogen for hydrotreating the product oil. Carbon dioxide is expected to be not only a major product from MIS retorting but could also be available in concentrated form by absorptive separation from the retort effluent. Residual gas from such absorption, rich in carbon monoxide, could be used for hydrogen production in a separate unit. It is concluded that oxygen, diluted about 9/1 (v/v) with either steam or CO_2, appears to be technically feasible as an injection gas for MIS retorting. At this concentration and at the flux tested (0.07 m^3/m^2 min O_2), both operations proceeded smoothly with acceptable maximum temperature. Retorting rates were comparable - about 2.2 m/day. Offgas lower heating values (LHV) (600 to 700 Btu/SCF), on a CO_2-and H_2S free basis, are much higher than those obtained with air as injection gas. As an example, the offgas from Run S-13 (equimolar steam/air; similar O_2 flux and shale), on the same basis, contained about 84 v% nitrogen and had an LHV of about 91 Btu/SCF. No significance is attached to the difference in oil yield between S-21 and S-23 in view of the difficulty in S-21 of separating product oil from the large volume of co-product water.

25087 **(UCRL—85312) Analysis of the operation of Occidental's Modified In-Situ Retort 6.** Campbell, J.H.; Peters, P.; Libicki, S.B.; Gregg, M.L.; Clarkson, J.E. (Lawrence Livermore National Lab., CA (USA)). May 1981. Contract W-7405-ENG-48. 20p. (CONF-810456—4). NTIS, PC A02/MF A01. Order Number DE81023662.

From 14. oil shale symposium; Golden, CO, USA (22 Apr 1981).

The operation of Occidental's Vertical Modified In-Situ Retort 6 is analyzed using data provided as part of the Phase I cooperative agreement with DOE. The analysis is divided into four parts. The first part evaluates the fluid flow through the rubble pile based on preburn tracer tests. These results are presented as a set of velocity contour plots showing the gas velocity distribution across the bed at given depths into the rubble pile. These velocity profiles are used to give a semi-quantitative picture of the porosity and permeability distribution through the bed. Part two of the analysis uses a thermocouple data taken during the burn to (a) present a physical picture of the motion of the retort front through the rubble bed, and (b) estimate the degree of oil coking based on heating rates. The third part of the Retort 6 analysis uses the offgas data taken during the burn to estimate the quantity of shale that was processed (i.e., the sweep efficiency) and the retorting rate within the bed. The fourth and final part of the analysis looks in detail at the major oil loss mechanisms that occurred during retorting. By examining the chemistry of the product oil from Retort 6 we are able to estimate the oil yield loss by coking, cracking, and combustion. This oil yield information, combined with our sweep efficiency estimates, are then used to predict the total oil recovery. 22 figures, 5 tables.

0405 Properties And Composition

REFER ALSO TO CITATION(S) 24900, 24901, 24902, 25054

0406 Direct Uses And By-products

REFER ALSO TO CITATION(S) 25795

0410 Enviromental Aspects

REFER ALSO TO CITATION(S) 26132

05 NUCLEAR FUELS

0501 Reserves

REFER ALSO TO CITATION(S) 25964

25088 (CRA—79-313-S) Long-run price projections for uranium: an evaluation of methodologies. Final report. (Charles River Associates, Inc., Boston, MA (USA)). Jul 1980. Contract AC13-76GJ01664. 227p. NTIS, PC A11/MF A01. Order Number DE81024135.

In this report methodologies are evaluated for projecting prices of U_3O_8 in the long run (roughly, beyond the year 2000) and suggest further research in the development of long-run price projections and also methodologies for projecting prices in the intermediate run (to 1990). The perspective that is brought to the evaluation of price projection methodologies is based in economics and engineering. Specifically of interest are the amount of U_3O_8 that could potentially be supplied (depending on the lead time, conventional and unconventional resources, available technologies, and the cost and availability of factor inputs into mining, milling, and exploration) and with the amount that will actually be supplied. The critical role of price in determining this latter quantity is explored.

25089 (DOE/ER/04972—1) Microcracks and energy. Progress report, April 1, 1980-February 28, 1981. Simmons, G.; Caruso, L. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Earth and Planetary Sciences). Mar 1981. Contract AS02-78ER04972. 83p. NTIS, PC A05/MF A01. Order Number DE81025648.

The study of the microcracks in granites from Redstone Quarry (NH), Granite Mountains (WY), and Sherman Mountain area (WY) shows the following: microcracks are abundant; most microcracks are sealed; common sealing phases are carbonate minerals, quartz, magnetite, hematite, Nb-bearing phosphate, a Ca and REE-bearing mineral, quartz, and feldspar; and many microcracks contain U. It is concluded that microcracks were the channels through which U migrated; that REEs are mobile; and that the mobilities of U and REEs may be related. It is suggested that sealed microcracks can be dated absolutely with modified fission track techniques. Cracks that contain U and cut quartz and also cracks that contain quartz and cut uraniferous minerals can be dated. Heat flow and heat generation in several provinces were examined and the data used to constrain models of the distribution of U, Th, and K in the crust. Seismic velocity was measured as a function of direction in several locations in New Hampshire where other researchers have mapped joints. Anisotropies in the velocities were found that correlate roughly with the joint distributions. The sealed fractures associated with a dike penetrated by the corehole at Redstone Quarry were examined. It is concluded tentatively that the cooling of rock in-situ from 600 to 100°C produced a significant volume of open fractures.

0502 Exploration

25090 (GJBX—171-81) Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 29 May 1981. Contract W-7405-ENG-26. 180p. (K/UR—320). NTIS, PC A09/MF A01. Order Number DE81025023.

Includes 1 sheet of 48x reduction microfiche.

Field and laboratory data are presented for 1239 water samples from the Wiseman Quadrangle, Alaska. The samples were collected by Los Alamos Scientific Laboratory; laboratory analysis and data reporting were performed by the Uranium Resource Evaluation Project at Oak Ridge, Tennessee.

25091 (GJBX—172-81) Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 29 May 1981. Contract W-7405-ENG-26. 177p. (K/UR—313). NTIS, PC E01/MF $3.50. Order Number DE81025004.

Includes 1 sheet of 48x reduction microfiche.

Field and laboratory data are presented for 1195 water samples from the Chandalar Quadrangle, Alaska. The samples were collected by Los Alamos Scientific Laboratory; laboratory analysis and data reporting were performed by the Uranium Resource Evaluation Project at Oak Ridge, Tennessee.

25092 (GJBX—179-81-Vol.1) Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle, Round Up quadrangle, Hardin quadrangle (Montana), Sheridan quadrangle, (Wyoming). Final report. (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-76GJ01664. 78p. NTIS, PC A05/MF A01. Order Number DE81025928.

An airborne combined radiometric and magnetic survey was performed for the Department of Energy (DOE) over the area covered by the Forsyth, Hardin, and Sheridan, and Roundup, 1:250,000 National Topographic Map Series (NTMS), quadrangle maps. The survey was part of DOE's National Uranium Resource Evaluation (NURE) program. Data were collected by a helicopter equipped with a gamma-ray spectrometer with a large crystal volume, and with a high sensitivity proton precession magnetometer. The radiometric system was calibrated at the Walker Field Calibration Pads and the Lake Mead Dynamic Test Range. Data quality was ensured during the survey by daily test flights and equipment checks. Radiometric data were corrected for live time, aircraft and equipment background, cosmic background, atmospheric radon, Compton scatter, and altitude dependence. The corrected data were statistically evaluated, plotted, and contoured to produce anomaly maps based on the radiometric response of individual geological units. The anomalies were interpreted and an interpretation map produced. Volume I contains a description of the systems used in the survey, a discussion of the calibration of the systems, the data collection procedures, the data processing procedures, the data presentation, the interpretation rationale, and the interpretation methodology. A separate Volume II for each quadrangle contains the data displays and the interpretation results.

25093 (GJBX—179-81-Vol.2A) Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle (Montana). Final report. (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-76GJ01664. 163p. NTIS, PC A08/MF A01. Order Number DE81025697.

Twelve uranium anomalies meet the minimum statistical requirements as defined in Volume I of this report. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eT), eU/eT, eU/K, eT/K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in Appendix F. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000 for presentation in Volume II.

25094 (GJBX—179-81-Vol.2B) Airborne gamma-ray spectrometer and magnetometer survey: Hardin quadrangle (Montana). Final report. (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-76GJ01664. 191p. NTIS, PC A09/MF A01. Order Number DE81025698.

Fifty-one uranium anomalies meet the minimum statistical requirements as defined in Volume I of this report. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eT), eU/eT, eU/K, eT/K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in Appendix F. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000 for presentation in Volume II.

25095 **(GJBX—179-81-Vol.2C) Airborne gamma-ray spectrometer and magnetometer survey: Sheridan quadrangle (Wyoming). Final report.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-76GJ01664. 256p. NTIS, PC A12/MF A01. Order Number DE81025694.

Sixty-two uranium anomalies meet the minimum statistical requirements as defined in Volume I of this report. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eT), eU/eT, eU/K, eT/K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in Appendix F. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000 for presentation in Volume II.

25096 **(GJBX—179-81-Vol.2D) Airborne gamma-ray spectrometer and magnetometer survey: Roundup quadrangle (Montana). Final report.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-76GJ01664. 170p. NTIS, PC A08/MF A01. Order Number DE81025699.

Thirty-seven uranium anomalies meet the minimum statistical requirements as defined in Volume I of this report. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eT), eU/eT, eU/K, eT/K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in Appendix F. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000 for presentation in Volume II.

25097 **(GJBX—180-81-Vol.1) Airborne gamma-ray spectrometer and magnetometer survey: Jordan quadrangle, Miles City quadrangle, Glendive quadrangle (Montana), Watford City quadrangle, (North Dakota). Final report.** (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-76GJ01664. 80p. NTIS, PC A05/MF A01. Order Number DE81025930.

An airborne combined radiometric and magnetic survey was performed for the Department of Energy (DOE) over the area covered by the Glendive, Miles City, Jordan, and Watford City, 1:250,000 National Topographic Map Series (NTMS), quadrangle maps. The survey was part of DOE's National Uranium Resource Evaluation (NURE) program. Data were collected by a helicopter equipped with a gamma-ray spectrometer with a large crystal volume, and with a high sensitivity proton precession magnetometer. The radiometric system was calibrated at the Walker Field Calibration pads and the Lake Mead Dynamic Test Range. Data quality was ensured during the survey by daily test flights and equipment checks. Radiometric data were corrected for live time, aircraft and equipment background, cosmic background, atmospheric radon, Compton scatter, and altitude dependence. The corrected data were statistically evaluated, plotted, and contoured to produce anomaly maps based on the radiometric response of individual geological units. The anomalies were interpreted and an interpretation map produced. Volume I contains a description of the systems used in the survey, a discussion of the calibration of the systems, the data collection procedures, the data processing procedures, the data presentation, the interpretation rationale, and the interpretation methodology. A separate Volume II for each quadrangle contains the data displays and the interpretation results.

0504 Feed Processing

REFER ALSO TO CITATION(S) 25100

0505 Enrichment

REFER ALSO TO CITATION(S) 25172, 25613

25098 **Utility view of DOE's enrichment policies.** Grube, R.M. pp vp of Atomic Industrial Forum, Inc. fuel cycle conference, 1979. Bethesda, MD; At Ind Forum, Inc (1979).

From Atomic Industrial Forum fuel cycle conference; Atlanta, GA, USA (11 Mar 1979).

Two types of enrichment contracts between utility corporations and DOE are discussed. They are requirements-type contracts and fixed commitment contracts. Their principles, pricing policy and other aspects are compared in favor of the former type from utility viewpoint.

0507 Fuels Production And Properties

REFER ALSO TO CITATION(S) 25904

25099 **(HEDL-SA—2332-FP) Secure automated fabrication: remote fabrication of breeder-reactor fuel.** Gerber, E.W.; Rice, L.H.; Horgos, R.M.; Nagamoto, T.T.; Graham, R.A. (Hanford Engineering Development Lab., Richland, WA (USA)). May 1981. Contract AC14-76FF02170. 11p. (CONF-810606—60). NTIS, PC A02/MF A01. Order Number DE81024095.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The Secure Automated Fabrication (SAF) Program was initiated at the Hanford Engineering Development Laboratory (HEDL) to develop and demonstrate an advanced manufacturing line (SAF line) for plutonium oxide breeder reactor fuel pins. The SAF line is to be installed in the Fuels and Materials Examination Facility (FMEF) at Hanford and will utilize technology that focuses on improved safety features for plant operating personnel, the public, and the environment. Equipment and process improvements incorporated by the SAF line will yield significant gains in nuclear materials safeguards, product quality and productivity.

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 25125, 25615

25100 **(ORNL/TM—7502) Removal of fluoride from aqueous nitric acid.** Pruett, D.J.; Howerton, W.B.; Mailen, J.C. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 26p. NTIS, PC A03/MF A01. Order Number DE81023853.

Several methods for removing fluoride from aqueous nitric acid were investigated and compared with the frequently used aluminum nitrate-calcium nitrate (Ca^{2+}-Al^{3+}) chemical trap-distillation system. Zirconium oxynitrate solutions were found to be superior in preventing volatilization of fluoride during distillation of the nitric acid, producing decontamination factors (DFs) on the order of 2×10^3 (vs $\sim$ 500 for the Ca^{2+}-Al^{3+} system). Several other metal nitrate systems were tested, but they were less effective. Alumina and zirconia columns proved highly effective in removing HF from HF-HNO_3 vapors distilled through the columns; fluoride DFs on the order of 10^6 and 10^4, respectively, were obtained. A silica gel column was very effective in adsorbing HF from HF-HNO_3 solutions, producing a fluoride DF of $\sim 10^4$.

0509 Transport And Storage

REFER ALSO TO CITATION(S) 25130

25101 **(AGNS—47921-2.1-14) Studies and research concerning BNFP design and construction of a spent-fuel disassembly/encapsulation system.** Dabolt, R.J. (Allied-General Nuclear Services, Barnwell, SC (USA)). Apr 1981. Contract AC09-79ET47921. 41p. NTIS, PC A03/MF A01. Order Number DE81025686.

Commercial light water power reactor operation in the United States is developing a cumbersome inventory of spent fuel. Systems for interim storage and handling of this fuel are being developed by the Federal Government and industry. Disassembly and

canning of the spent fuel elements is one of these systems. It has the potential to double the storage capacity of a prereprocessing storage facility or to triple the capacity of conventional shipping casks. Prototype equipment and controls required to perform this operation in a dry environment have been primarily designed and fabricated at the Barnwell Nuclear Fuel Plant (BNFP). Ridihalgh, Eggers, and Associates have provided design support and fabrication of the control system. This system is capable of extracting and canning the fuel pins and compacting the nonfuel-bearing components of spent fuel assemblies at processing rates of 10 to 12 assemblies per day. The process also provides the potential for enhanced inspection and assay of spent fuel by reducing the interference encountered from the high gamma fields of the nonfuel bearing hardware.

25102 **(MLM—2842(OP)) Computerized waste-accountability shipping and packaging system.** Jackson, J.A.; Baston, M. Jr.; DeVer, E.A. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 4p. (CONF-810706—7). NTIS, PC A02/MF A01.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

The Waste Accountability, Shipping and Packaging System (WASP) is a real-time computerized system designed and implemented by Mound Facility to meet the stringent packaging and reporting requirements of radioactive waste being shipped to burial sites. The system stores packaging data and inspection results for each unit and prepares all necessary documents at the time of shipment. Shipping data specific for each burial site are automatically prepared on magnetic tape for transmission to the computing center at that site. WASP has enabled Mound Facility to effectively meet the requirements of the burial sites, diminishing the possibility of being rejected from a site because of noncompliance.

0510 Marketing And Economics

REFER ALSO TO CITATION(S) 25612

25103 **Atomic Industrial Forum, Inc. fuel cycle conference, 1979.** Bethesda, MD; At Ind Forum Inc (1979). vp. (CONF-7903153—).

From Atomic Industrial Forum fuel cycle conference; Atlanta, GA, USA (11 Mar 1979).

This conference contains a collection of 16 papers all of which are indexed separately. The subjects covered include U.S. nuclear policy and the fuel cycle; Uranium supply; Enrichment services; waste management and some special issues.

25104 **Near-term market conditions.** Patterson, J.A. (DOE, Washington, DC). pp vp of Atomic Industrial Forum, Inc. fuel cycle conference, 1979. Bethesda, MD; At Ind Forum, Inc (1979).

From Atomic Industrial Forum fuel cycle conference; Atlanta, GA, USA (11 Mar 1979).

Information is reviewed available to DOE on uranium marketing and price situation. It is concluded that past procurement activity and slippage in needs has placed the uranium users in a comfortable supply position for the next few years. As a consequence, there has been a relatively low level of procurement activity the last few years, which have been accompanied by price stability. U.S. procurement has strongly favored U.S. suppliers, however, the potential exists for procurement of foreign uranium, particularly in long-term contracts. Domestic producers, having expanded their production and sales capability, will be in a strong position for deliveries over the next several years.

0520 Waste Management

REFER ALSO TO CITATION(S) 25164, 25165, 25167, 25168, 25169, 25973, 26161, 26197, 26198, 26286, 26404, 26405, 26406, 26421, 26430

25105 **(CONF-801217—) Modeling and low-level waste management: an interagency workshop.** Little, C.A.; Stratton, L.E. (comps.). (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 388p. NTIS, PC A17/MF A01. Order Number DE81025085.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

The interagency workshop on Modeling and Low-Level Waste Management was held on December 1-4, 1980 in Denver, Colorado. Twenty papers were presented at this meeting which consisted of three sessions. First, each agency presented its point of view concerning modeling and the need for models in low-level radioactive waste applications. Second, a larger group of more technical papers was presented by persons actively involved in model development or applications. Last of all, four workshops were held to attempt to reach a consensus among participants regarding numerous waste modeling topics. Abstracts are provided for the papers presented at this workshop.

25106 (CONF-801217—, pp 3-8) **USDOE needs in modeling for low-level radioactive waste management.** Large, D.E. (Dept. of Energy, Oak Ridge, TN). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

The Department of Energy does not need additional models as entities. The Department needs reliable and credible tools for decision making which involve identification, selection, adaptation and implementation of existing models. Recently, the Low-Level Waste Management Program issued a strategy document which endorses states being allowed to assume and implement their responsibilities for managing their respective low-level wastes: it identifies areas of assistance that federal agencies can provide to states. The states must decide upon a course of action regarding siting and selection of disposal sites; making that decision often requires the use of environmental models as decision-making tools. The Department's principal short-term goal is to provide a siting model by September 1981. The siting model is needed by decision to examine the adequacy of a site, explore various alternatives and develop preliminary operating and design criteria. The Department's basic guidance and approach to this model development, consideration and treatment of models are discussed. Also a discussion of criteria is presented. A model should be used to determine how effectively a site will meet criteria. At the present time there are no recognized and approved criteria for reference or implementation. The federal agencies must come to an agreement on what models are expected to provide. A few major items which the Department believes can only be resolved through the effective interaction of the federal agencies are also pointed out.

25107 (CONF-801217—, pp 9-19) **Modeling and analyses to support EPA's low-level radioactive waste standards.** Meyer, G.L. (Environmental Protection Agency, Washington, DC). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

EPA is developing a generally applicable standard for the management and disposal of LLW as part of the US National Radioactive Waste Management Program. It will issue a proposed standard in September 1981 and a final standard in early 1984. EPA will use predetermined models to estimate the health risks and costs/benefits from disposing of LLW by a number of land and sea disposal alternatives. These estimates will be used to support EPA's decision on the proposed standard and for the supporting EIS and Regulatory Analysis. This paper describes why EPA is using a generic systems approach to modeling the impact of LLW disposal, the types of disposal alternatives which will be evaluated, its approach to cost/benefit analysis, the current status of model development, general input data requirements for the model, and a general schedule for development of the models and the standard.

25108 (CONF-801217—, pp 21-30) **Modeling in low-level radioactive waste management from the US Geological Survey perspective.** Robertson, J.B. (Geological Survey, Reston, VA). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

The United States Geological Survey (USGS) is a long-standing proponent of using models as tools in geohydrologic investigations. These models vary from maps and core samples to elaborate digital computer algorithms, depending on the needed application and resources available. Being a non-regulatory scientific

agency, the USGS uses models primarily for: improving modeling technology, testing hypotheses, management of water resources, providing technical advice to other agencies, parameter sensitivity analysis, and determination of parameter values (inverse problems). At low-level radioactive waste disposal sites, we are most interested in developing better capabilities for understanding the groundwater flor regime within and away from burial trenches, geochemical factors affecting nuclide concentration and mobility in groundwater, and the effects that various changes in the geohydrologic conditions have on groundwater flow and nuclide migration. Although the Geological Survey has modeling capabilities in a variety of complex problems, significant deficiencies and limitations remain in certain areas, such as fracture flow conditions and solute transport in the unsaturated zone. However, even more serious are the deficiencies in measuring or estimating adequate input data for models and verification of model utility on real problems. Flow and transport models are being used by the USGS in several low-level disposal site studies, with varying degrees of sucess.

25109 (CONF-801217—, pp 31-39) **Low-level radioactive waste modeling needs from the USNRC perspective.** Smith, R.D.; Hawkins, E.F. (Nuclear Regulatory Commission, Washington, DC). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

The NRC is developing a low-level waste regulation to be issued for public comment by April 30, 1981. Publication of the final rule and final EIS is expected in 1982. This regulation, 10 CFR Part 61 will apply only to near surface disposal. Two basic approaches have been considered in developing specific regulations: a prescriptive approach and a performance objective approach. To accomplish the licensing and regulation of low-level waste disposal facilities, the information that will be needed and the methodologies to be used to assess performances are being established. Regulatory guides will cover site selection and characterization, facility design and operations, waste classification, waste form performance, site closure, post-operational surveillance, funding and monitoring. In developing licensing review procedures, initial efforts are to establish analytical modeling capabilities. We are establishing our modeling needs, determining models availability, obtaining potentially useful models and adopting those that meet our needs. As a test case, the Barnwell facility will be modeled and its performance assessed. Our analyses will then be compared with those of our contractor, ORNL and the Licensee.

25110 (CONF-801217—, pp 43-63) **Modeling contaminant transport in porous media in relation to nuclear-waste disposal: a review.** Grove, D.B.; Kipp, K.L. (Geological Survey, Denver, CO). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

The modeling of solute transport in saturated porous media is reviewed as it is applied to the movement of radioactive waste in the subsurface. Those processes, both physical and chemical, that affect radionuclide movement are discussed and the references that best illustrate these processes listed. Movement is separated into convection, convection-dispersion, and convection-dispersion and chemical reactions. Solutions of equations describing such movement are divided into one-, two-, and three-dimensional analytical and numerical examples. Discussions of recent work in the area of stochastic modeling are followed by discussions of applications of the models to selected field sites.

25111 (CONF-801217—, pp 65-79) **Optimum model to predict radionuclide transport in an aquifer for the application to health effects evaluations.** Hung, C.Y. (Environmental Protection Agency, Washington, DC). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

An optimum groundwater transport model for simulating radionuclide transport in an aquifer using an approximate solution of the basic transport equation is presented. The model is designed to avoid: (1) relatively high computer simulation costs normally experienced in numerical models; and (2) the large errors which are sometimes introduced when the physical boundary conditions are converted to a mathematical form suitable for an analytical model. The model neglects the effect of radionuclide transport through dispersion first and then compensates for this effect later with a health effects correction factor. This correction factor is found to be a function of the Peclete number and the transport number, which has been defined, and can be determined by using the parameters of the groundwater transport system. The model has a low cost of simulation and yet maintaining reasonable accuracy for the peak and cumulative radionuclide discharges, which are of primary interest for risk assessments. Preliminary analyses indicated that the model can be integrated into most of the risk assessment models for health effects evaluations.

25112 (CONF-801217—, pp 81-137) **Modeling of water and solute transport under variably saturated conditions: state of the art.** Lappala, E.G. (Geological Survey, Denver, CO). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

This paper reviews the equations used in deterministic models of mass and energy transport in variably saturated porous media. Analytic, quasi-analytic, and numerical solution methods to the nonlinear forms of transport equations are discussed with respect to their advantages and limitations. The factors that influence the selection of a modeling method are discussed in this paper; they include the following: (1) the degree of coupling required among the equations describing the transport of liquids, gases, solutes, and energy; (2) the inclusion of an advection term in the equations; (3) the existence of sharp fronts; (4) the degree of nonlinearity and hysteresis in the transport coefficients and boundary conditions; (5) the existence of complex boundaries; and (6) the availability and reliability of data required by the models.

25113 (CONF-801217—, pp 139-154) **Verification of partially saturated zone moisture migration: model and field facilities.** Phillips, S.J.; Jones, T.L. (Rockwell International, Richland, WA). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

Two large field-experimental facilities, designed to evaluate moisture migration under partially saturated geohydrologic conditions, have been constructed on the Hanford Site. The function of these facilities is to monitor the rate and magnitude of moisture migration. Models have been used to simulate and predict one dimensional liquid and vapor phase water migration. Parametric data from these facilities are being used for verification of the UNSAT and MPHASE codes. To date, these models have shown only limited success in the simulation of: volumetric water content, water storage, water drainage, liquid flux and vapor flux. Continued studies will enhance the capability to simulate, predict and verify moisture migration and radionuclide transport under field conditions at the Hanford Site.

25114 (CONF-801217—, pp 187-196) **Fracture flow modeling for low-level nuclear waste disposal.** Kanehiro, B.Y.; Wilson, C.R.; Guvanasen, V.; Witherspoon, P.A. (Lawrence Berkeley Lab., CA). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

Fracture flow modeling as applied to low level radioactive waste disposal sites is discussed. Low level waste disposal sites presently exist in fractured basalts, crystalline igneous rocks, and limestones. The primary objective of forecasting the migration of radionuclides from these sites requires the consideration of fracture flow modeling. Such modeling is also an integral part of the planning and analysis of field work at the site. Fundamental mathematical models describing discrete fracture flow and equivalent anisotropic porous medium flow are reviewed. Consideration is given to the theoretical and field aspects of the problem of when and how to treat a fractured medium as an equivalent anisotropic porous medium. The input parameters required for each type of model are discussed. Finally a brief description of some of the models developed at the Lawrence Berkeley Laboratory is given. The models include those based on the integrated finite difference, polygonal finite difference, and finite-element schemes.

25115 (CONF-801217—, pp 197-213) **Conceptual analysis of the groundwater flow system at the Maxey Flats radioactive waste burial site, Fleming County, Kentucky.** Pollock, D.W.; Zehner, H.H. (Geological Survey, Reston, VA). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

The complex groundwater system at the Maxey Flats radioactive waste burial site in Fleming County, Kentucky was investigated with the aid of a highly simplified, steady state, groundwater flow model. An analysis of the local hydrogeology suggests that at least two saturated groundwater flow systems are present at the site: a lower system in the bottom part of the Ohio Shale, and an upper, perched system extending from the base of the Bedford Shale up to a water table in the weathered part of the Nancy Member of the Bordon Formation. Unsaturated conditions may also exist in the Sunbury Shale. Simulations indicate that most of the water which recharges the upland surface of Maxey Flats is eventually discharged as seepage along the hillside through the upper part of the Farmers Member of the Bordon Formation and the Sunbury Shale.

25116 (CONF-801217—, pp 215-248) **Computer simulation of groundwater flow at a commercial radioactive-waste landfill near West Valley, Cattaraugus County, New York.** Prudic, D.E. (Geological Survey, Albany, NY). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

Commercial low-level radioactive wastes were buried in trenches excavated in a clay-rich till of low hydraulic conductivity near West Valley, NY, from 1963 to 1975. Groundwater from the trenches flows out laterally and downward through approximately 25 m of till. A two-dimensional finite-element computer model was used to evaluate factors controlling groundwater flow is two vertical sections. Measured heads in 24 piezometers along these sections were most accurately reproduced by simulating four geologic units, each internally isotropic but differing in hydraulic conductivity to reflect fracturing near land surface and increased consolidation with depth. The model accurately simulated the changes in head that followed removal of water from one of the trenches. Specific-storage values required to calibrate the model for transient conditions agreed well with values derived from four consolidation tests of till samples. Infiltration rates ranging from 3.8 centimeters per year near swampy areas to 1.5 cm/y along scraped or smooth, sloping surfaces were used to simulate observed areal variation of head in the till. Simulations indicated that water flowing laterally out of trench would not intersect nearby intermittent streams as long as the water level in that trench remained below the trench cover.

25117 (CONF-801217—, pp 303-314) **Risk assessment and radioactive waste management.** Cohen, J.J.; Smith, C.F. (Lawrence Livermore National Lab., CA). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

In order to evaluate the hazard of toxic material buried underground, the concept of geotoxicity is presented. This concept permits the development of a tool for quantifying the degree of hazard of such material, and this tool is formulated as the geotoxicity hazard index. The components of the geotoxicity hazard index are described and discussed. Finally, some sample results are offered. A more detailed description can be found in the report A Hazard Index for Underground Toxic Material, UCRL-52889, June 1980.

25118 (CONF-801217—, pp 333-339) **Models and criteria for LLW disposal performance.** Smith, C.F.; Cohen, J.J. (Lawrence Livermore National Lab., CA). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

A primary objective of the Low Level Waste (LLW) Management Program is to assure that public health is protected. Predictive modeling, to some extent, will play a role in meeting this objective. This paper considers the requirements and limitations of predictive modeling in providing useful inputs to waste management decision making. In addition, criteria development needs and the relation between criteria and models are discussed.

25119 **(CONF-810606—48) Disposal of nuclear wastes by transmutation.** Blomeke, J.O.; Croff, A.G. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE81024909.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

A study was made of the feasibility of partition and transmutation (P-T) of actinides, ^{99}Tc, and ^{129}I in radioactive wastes. An incremental analysis was performed on a reference fuel cycle and a P-T fuel cycle. Short-term risks from fuel cycle operations and long-term risks from a repository were estimated for cases with and without P-T. Results show that P-T cannot be justified because of the small radiological benefits and substantially increased costs. 1 table. (DLC)

25120 **(CONF-810722—1) Groundwater-stream-simulation experiments for the evaluation of the safety of proposed nuclear waste repositories.** Seitz, M.G. (Argonne National Lab., IL (USA)). 1981. Contract W-31-109-ENG-38. 3p. NTIS, PC A02/MF A01. Order Number DE81023527.

From International symposium on migration in the terrestrial environment of long-lived radionuclides from the nuclear fuel cycle; Knoxville, TN, USA (27 Jul 1981).

A bench-scale experimental design which integrates repository components to simulate a groundwater stream infiltrating a breached repository is described in this paper. An experiment performed with a nuclear waste solid and one rock core is briefly summarized. The nuclear waste solid consists of borosilicate glass containing formulated nuclear waste and is the source of the leached radionuclides. The rock core used is of granite and serves as the adsorption medium for the leached radionuclides. (DMC)

25121 **(DOE/NWTS—80-1) Geologic disposal of radioactive waste: program plan for field testing.** (USDOE Office of National Waste Terminal Storage Integration, Columbus, OH. Battelle Project Management Div.). Apr 1981. 70p. NTIS, PC A04/MF A01. Order Number DE81025615.

A series of program plans is being developed to address the field testing needs for various candidate repository host rocks: salt, granitic rocks, tuff, and basalt. This document, NWTS-80(1), is the first plan of the series, and is intended to provide the framework on which subsequent, rock-specific program plans will be based. The series of Field Testing Program Plans (the NWTS-80 series) is as follows: NWTS-80(1) - Geologic Disposal of Radioactive Waste: Program Plan for Field Testing; NWTS-80(2) - Program Plan for Field Tests in Salt; NWTS-80(3) - Program Plan for Field Tests in Granitic Rock; NWTS-80(4) - Program Plan for Field Tests in Basalt at Hanford; and NWTS-80(5) - Program Plan for Field Tests in Tuff at Nevada Test Site. These plans will be revised on a regular basis as issues are resolved or new ones identified, to reflect the evolution of the Field Testing Program.

25122 **(DOE/UMT—0103) Engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado.** (Ford, Bacon and Davis Utah, Inc., Salt Lake City (USA)). Jun 1981. Contract AC04-76GJ01658. 230p. (FBDU—360-06). NTIS, PC A11/MF A01. Order Number DE81025611.

Ford, Bacon and Davis Utah Inc. has reevaluated the Durango site in order to revise the November 1977 engineering assessment of the problems resulting from the existence of radioactive uranium mill tailings at Durango, Colorado. This engineering assessment has included the preparation of topographic maps, the performance of core drillings and radiometric measurements sufficient to determine areas and volumes of tailings and radiation exposures of individuals and nearby populations, the investigations of site hydrology and meteorology, and the evaluation and costing of alternative corrective actions. Radon gas released from the nearly 1.6 million tons of tailings at the Durango site constitutes the most significant environmental impact, although windblown tailings and external gamma radiation also are factors. The four alternative actions presented in this engineering assessment range from millsite and offsite decontamination with the addition of 3 m of stabilization cover

material (Option I), to removal of the tailings to remote disposal sites and decontamination of the tailings site (Options II through IV). Cost estimates for the seven options range from about $10,700,000 for stabilization in-place, to about $21,800,000 for disposal at a distance of about 10 mi. Three principal alternatives for the reprocessing of the Durango tailings were examined: (a) heap leaching; (b) treatment at an existing mill; and (c) reprocessing at a new conventional mill constructed for tailings reprocessing. The cost of the uranium recovered would be about $30/lb U_3O_8 by either heap leach or conventional plant processes.

25123 (DOE/UMT—0103S) Summary of the engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado. (Ford, Bacon and Davis Utah, Inc., Salt Lake City (USA)). Jun 1981. Contract AC04-76GJ01658. 56p. (FBDU—360-06S). NTIS, PC A04/MF A01. Order Number DE81025610.

Ford, Bacon and Davis Utah Inc. has reevaluated the Durango site in order to revise the November 1977 engineering assessment of the problems resulting from the existence of radioactive uranium mill tailings at Durango, Colorado. This engineering assessment has included the preparation of topographic measurements sufficient to determine areas and volumes of tailings and radiation exposures of individuals and nearby populations, the investigations of site hydrology and meteorology, and the evaluation and costing of alternative corrective actions. Radon gas released from the nearly 1.6 million tons of tailings at the Durango site constitutes the most significant environmental impact, although windblown tailings and external gamma radiation also are factors. The four alternative actions presented in this engineering assessment range from millsite and off-site decontamination with the addition of 3 m of stabilization cover material (Option I), to removal of the tailings to remote disposal sites and decontamination of the tailings site (Options II through IV). Cost estimates for the seven options range from about $10,700,000 for stabilization in-place, to about $21,800,000 for disposal at a distance of about 10 mi. Three principal alternatives for the reprocessing of the Durango tailings were examined: (a) heap leaching; (b) treatment at an existing mill; and (c) reprocessing at a new conventional mill constructed for tailings reprocessing.

25124 (DPST—80-466) Environmental analysis burial of offsite low-level waste at SRP. Poe, W.L.; Moyer, R.A. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Dec 1980. Contract AC09-76SR00001. 86p. NTIS, PC A05/MF A01. Order Number DE81025593.

The environmental effects of receipt and burial of low-level naval waste generated at Department of Energy Laboratories are assessed in this environmental analysis. Through 1979, this low-level DOE waste was sent to the NRC-licensed burial ground operated by Chem-Nuclear Systems, Inc., at Barnwell, South Carolina. DOE announced on October 26, 1979, that DOE-generated low-level waste would no longer be buried at commercial waste burial sites. SRP was selected to receive the naval waste described in this analysis. Receipt and burial of these wastes will have a negligible effect on SRP's environment and increase only slightly the environmental effects of the SRP operations discussed in the EIS on SRP waste management operations. The environmental effects of burial of this waste at Chem-Nuclear Burial Ground or at the SRP Burial Ground are described in this environmental analysis to permit assessment of incremental effects caused by the decision to bury this naval waste in the SRP Burial Ground rather than in the Barnwell Burial Ground. The radiological effects from burial of this waste in either the SRP or Chem-Nuclear Burial Ground are very small when compared to those from natural background radiation or to the annual population dose commitment from operation of SRP. The environmental effects of burial at SRP to dose commitments normally received by the population surrounding SRP are compared.

25125 (ENICO—1086) Process verification testing for burning TBP-containing organic solvents in the NWCF. Schindler, R.E. (Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)). Jun 1981. Contract AC07-79ID01675. 33p. NTIS, PC A03/MF A01. Order Number DE81024407.

The feasibility of disposal of TBP-containing, contaminated organic reprocessing solvents by burning them as part of the fuel used in the fluidized-bed calcination of aqueous reprocessing wastes in the New Waste Calcining Facility was verified in a series of pilot-plant tests. The test series and test results are presented.

25126 (NVO—196-17-Rev.1) Nevada Nuclear Waste Storage Investigations: Quality Assurance Plan. (USAEC Nevada Operations Office, Las Vegas). Apr 1981. 40p. NTIS, PC A03/MF A01. Order Number DE81025614.

This document is the first revision of the Nevada Nuclear Waste Storage Investigations, Quality Assurance Plan (NVO-196-17) published in August 1980. It contains several substantive revisions and numerous minor revisions (e.g., WMPO/NV vs. Project Office, Los Alamos National Laboratory vs. Los Alamos Scientific Laboratory, etc.) which update or clarify the August 1980 document. NVO-196-17 (Rev. 1) supercedes NVO-196-17.

25127 (NVO—196-22) Nevada Nuclear Waste Storage Investigations. Geologic and hydrologic investigation of Yucca Mountain: peer review documentation. (Department of Energy, Las Vegas, NV (USA). Nevada Operations Office). Apr 1981. 106p. NTIS, PC A06/MF A01.

This document is a compilation of review comments on the geologic and hydrologic investigation of Yucca Mountain. This investigation is being managed by the Nevada Nuclear Waste Storage Investigations (NNWSI). The principal NNWSI participant organizations conducting the investigation are the US Geological Survey and the Los Alamos National Laboratory. The objective of this investigation is to determine whether Yucca Mountain is a technically acceptable location to site an underground, high-level nuclear waste repository. The NNWSI are a part of the National Waste Terminal Storage (NWTS) Program of the US Department of Energy (DOE). The NNWSI are in the process of developing or improving the technology for high-level nuclear waste handling, containment, and isolation, and determining whether potentially suitable rock units on or adjoining the Nevada Test Site (NTS) are technically acceptable for a licensed, permanent nuclear waste repository. The review comments compiled in this document are the result of a peer review meeting and tour conducted on September 23-25, 1980, in Las Vegas and at the NTS. The list of peer reviewers and agendas for the three days of the review precede the review comments. The correspondence transmitting the reviews are presented in chronological order. The later review commentaries are those of the NNWSI Technical Project Officers representing the US Geological Survey and the Los Alamos National Laboratory. The final summary review commentary is that of the NNWSI Technical Overview Contractor, Sandia National Laboratories.

25128 (NVO—196-23) Nevada Nuclear Waste Storage Investigations. Radionuclide migration in tuff and granite: peer review documentation. (Department of Energy, Las Vegas, NV (USA). Nevada Operations Office). Apr 1981. 87p. NTIS, PC A05/MF A01.

This document is a compilation of review comments on the tuff and granite radionuclide migration investigations. These investigations are being managed by the Nevada Nuclear Waste Storage Investigations (NNWSI). The principal NNWSI participants conducting the investigations in tuff are the Los Alamos National Laboratory, Sandia National Laboratories, and Argonne National Laboratory, and for granite, the Lawrence Livermore National Laboratory. These investigations will determine radionuclide migration/retardation in tuffaceous and granitic rocks in situ. The NNWSI are a part of the National Waste Terminal Storage (NWTS) Program of the US Department of Energy (DOE). The NNWSI are in the process of developing or improving the technology for high-level nuclear waste handling, containment, and isolation, and determining whether potentially suitable rock units on or adjoining the Nevada Test Site (NTS) are technically acceptable for a licensed, permanent nuclear waste repository. The review comments compiled in this document are the result of a peer review meeting conducted on August 18-19, 1980, at the DOE/NV building in Las Vegas, Nevada, The list of peer reviewers and the agenda for the review precede the review comments. The correspondence transmitting the reviews are presented in chronological order. The later review commentaries are those of the NNWSI Technical Project Officers representing the Los Alamos National Laboratory and the Lawrence Livermore National Laboratory. The final summary review

commentary is that of the NNWSI Technical Overview Contractor, Sandia National Laboratories.

25129 **(ONWI—9(2)(80)) Technical progress report for the quarter January 1-March 31, 1980.** (Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). 1980. Contract AC06-76RL01830. 356p. NTIS, PC A16/MF A01. Order Number DE81010320.

This document reports progress in the fields of science and technology, process and equipment development, systems analysis, site identification, facilities engineering, site qualification and licensing, and social science and support services. (DLC)

25130 **(PNL—3000-9) Nuclear waste management. Quarterly progress report, January-March, 1981.** Chikalla, T.D.; Powell, J.A. (comp.). (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 164p. NTIS, PC A08/MF A01. Order Number DE81025531.

Reports and summaries are provided for the following programs: high-level waste process development; alternative waste forms; nuclear waste materials characterization center; TRU waste immobilization; TRU waste decontamination; krypton solidification; thermal outgassing; iodine-129 fixation; NWVP off-gas analysis; monitoring and physical characterization of unsaturated zone transport; well-logging instrumentation development; verification instrument development; mobility of organic complexes of radionuclide in soils; low-level waste generation reduction handbook; waste management system studies; assessment of effectiveness of geologic isolation systems; waste/rock interactions technology program; high-level waste form preparation; development of backfill materials; development of structural engineered barriers; disposal charge analysis; analysis of spent fuel policy implementation; spent fuel and pool component integrity program; analysis of postulated criticality events in a storage array of spent LWR fuel; asphalt emulsion sealing of uranium mill tailings; liner evaluation for uranium mill tailings; multilayer barriers for sealing of uranium tailings; application of long-term chemical biobarriers for uranium tailings; and revegetation of inactive uranium tailings sites.

25131 **(PNL—3678) Nuclear waste management and environmental mediation: an exploratory analysis. Topical report.** Greene, M.R.; Lindell, M.K.; Nealey, S.M.; Drexler, J.A. Jr. (Battelle Human Affairs Research Center, Seattle, WA (USA)). Sep 1980. Contract AC06-76RL01830. 45p. NTIS, PC A03/MF A01.

Two types of mediation efforts are identified: settlement-oriented mediation and participation-oriented mediation. A range of environmental mediation efforts that have taken place to date are discussed. Within the context of the two identified types of mediation, these characteristics are discussed for the waste management controversy. Emphasis was placed on the complexity of the issues and the range of participants. Also discussed are the relationship between an environmental mediation effort and alternative mechanisms for conflict resolution, such as NEPA based litigation, consultation and concurrence and state veto or federal preemption. Participation-oriented mediation may be more suitable than settlement-oriented mediation for encouraging constructive communication and reducing conflict among participants in the controversy. Several limitations to participation-oriented mediation need to be considered. One is that environmental mediation is such a very new field that it might not be possible to find an experienced mediator willing to attempt such a complex problem. Two is the compatibility of participation-oriented and settlement-oriented mediation.

25132 **(PNL—3742) Design and performance of a full-scale spray calciner for nonradioactive high-level-waste-vitrification studies.** Miller, F.A. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 243p. NTIS, PC A11/MF A01.

In the spray calcination process, liquid waste is spray-dried in a heated-wall spray dryer (termed a spray calciner), and then it may be combined in solid form with a glass-forming frit. This mixture is then melted in a continuous ceramic melter or in an in-can melter. Several sizes of spray calciners have been tested at PNL-laboratory scale, pilot scale and full scale. Summarized here is the experience gained during the operation of PNL's full-scale spray calciner, which has solidified ~ 38,000 L of simulated acid wastes and ~ 352,000 L of simulated neutralized wastes in 1830 h of processing time. Operating principles, operating experience, design aspects, and system descriptions of a full-scale spray calciner are discussed. Individual test run summaries are given in Appendix A. Appendices B and C are studies made by Bechtel Inc., under contract by PNL. These studies concern, respectively, feed systems for the spray calciner process and a spray calciner vibration analysis. Appendix D is a detailed structural analysis made at PNL of the spray calciner. These appendices are included in the report to provide a complete description of the spray calciner and to include all major studies made concerning PNL's full-scale spray calciner.

25133 **(PNL—3752) Asphalt emulsion sealing of uranium mill tailings. 1980 annual report.** Hartley, J.N.; Koehmstedt, P.L; Esterl, D.J.; Freeman, H.D.; Buelt, J.L.; Nelson, D.A.; Elmore, M.R. (Battelle Pacific Northwest Labs., Richland, WA (USA)). May 1981. Contract AC06-76RL01830. 163p. NTIS, PC A08/MF A01. Order Number DE81025226.

Studies of asphalt emulsion sealants conducted by the Pacific Northwest Laboratory have demonstrated that the sealants are effective in containing radon and other potentially hazardous material within uranium tailings. The laboratory and field studies have further demonstrated that radon exhalation from uranium tailings piles can be reduced by greater than 99% to near background levels. Field tests at the tailings pile in Grand Junction, Colorado, confirmed that an 8-cm admix seal containing 22 wt% asphalt could be effectively applied with a cold-mix paver. Other techniques were successfully tested, including a soil stabilizer and a hot, rubberized asphalt seal that was applied with a distributor truck. After the seals were applied and compacted, overburden was applied over the seal to protect the seal from ultraviolet degradation.

25134 **(PNL-SA—9102) Correlations between pH and glass leaching.** Buckwalter, C.Q.; McVay, G.L. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Apr 1981. Contract AC06-76RL01830. 16p. (CONF-810528—4). NTIS, PC A02/MF A01.

From 83. symposium on nucleation and crystallization in glasses; Washington, DC, USA (3 May 1981).

The effect of pH on the dissolution of glass constituents from three simple silicate glass compositions and one waste glass during leaching experiments is illustrated. All glasses were leached in modified D.I. water according to the MCC-1 procedure. Leachate analysis was done by ICP and solid state analyses by SEM. The major conclusion is that the mechanism of dissolution is different when comparing a silicate and a borosilicate glass. The borosilicate glasses react more readily in an acid medium, whereas the silicate-based glasses are relatively unreactive. The addition of the rare earths in the waste glass enhance the dissolution of the borosilicate glass in the acid medium. Both borosilicate glasses exhibit greater chemical durability in the high base medium, whereas the silicate glass tends to dissolve.

25135 **(RHO-BWI-C—94) Parametric and sensitivity analysis of waste isolation in a basalt medium.** Arnett, R.C.; Baca, R.G.; King, I.P.; McLaughlin, D.B.; Norton, W.R. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Feb 1981. Contract AC06-77RL01030. 175p. NTIS, PC A08/MF A01. Order Number DE81025779.

This report presents the analysis and findings of a numerical modeling study. The purpose of the study was to examine the waste isolation characteristics of the basalt formations. The study basically represents a hydrologic analysis which considers hypothetical release conditions. A parametric and sensitivity analysis approach was used in conjunction with a decision-tree strategy. This approach leads to a systematic and conservative analysis of hydrologic and transport processes. The modeling methodology used in this study is based on the use of numerical models which simulate the coupled processes of groundwater flow, heat transport, and nuclide migration in a fractured-porous media. Applications of these models provided estimates of the changes in the thermal field, groundwater flow patterns, and contaminant plumes as a function of hydrologic and transport parameters. Principal findings of this

parametric and sensitivity analysis indicate that the basic hydraulic properties, such as permeability, play a significant role in determining the specific patterns of groundwater flow and nuclide migration. With regard to nuclide migration, however, the magnitude of the initial inventory and the sorption properties generally determine the rate and extent of nuclide movement. Heat transport coupling to groundwater dominate the flow pattern in early times by virtue of buoyancy effects. Long-term simulations, i.e., 250,0000 years, indicate that for the most conservative conditions the radionuclides released from the repository are contained in the host basalt formation. This suggests that the natural barriers can achieve a high degree of waste isolation.

25136 **(RHO-BWI-CD—51(Rev.2)) Site characterization plan basalt waste isolation project.** (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). 31 Jul 1980. Contract AC06-77RL01030. 246p. NTIS, PC A11/MF A01. Order Number DE81025606.

The National Waste Terminal Storage (NWTS) Program of the US Department of Energy (DOE) is aimed at examining a variety of rock formations and geologic environments to assess their suitability as sites for nuclear waste repositories. A statement of position by DOE (DOE, 1980) clearly states objectives of the National Waste Terminal Storage (NWTS) and Basalt Waste Isolation Project (BWIP) and discusses the many individual steps that will be taken before a nuclear waste repository will be constructed and used. The BWIP of the DOE is an element of the NWTS concerned with addressing the suitability of the deep basalts beneath the Hanford Site as a medium for final disposal of nuclear waste. These studies have been under way since the inception of the NWTS program. This report summarizes the results of these studies which have led to the identification of a set of candidate sites within the Hanford Site which appear suitable for siting a nuclear waste repository. Geological, hydrological, and other technical studies have been under way on the Hanford Site for several years. Based on the data gathered from the studies, the site selection process has logically proceeded to the point of selecting a preferred location of approximately 70 square miles (181 square kilometers). The next logical step is to perform sufficient characterization activities to allow a preferred site of about 10 square miles (26 square kilometers) to be selected. The remainder of this document reports the activities that have taken place to date, and the planned efforts to allow the selection of a viable preferred site within the Hanford Site.

25137 **(RHO-BWI-SA—64) Engineered barrier development for a nuclear waste repository in basalt.** Smith, M.J. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). May 1980. Contract AC06-77RL01030. 28p. (CONF-8005175—1). NTIS, PC A03/MF A01. Order Number DE81024439.

From American Chemical Society meeting; Portland, OR, USA (15 May 1980).

The BWIP Engineered Barrier Program has been developed to provide an integrated approach to the development of site-specific Engineered Barrier assemblages for a repository located in basalt. The goal of this program is to specify engineered and natural barriers which will ensure that nuclear and non-radioactive hazardous materials emplaced in a repository in basalt do not exceed acceptable rates of release to the biosphere. A wide range of analytical and experimental activities related to the basalt repository environment, waste package environment, waste/barrier/rock interactions, and barrier performance assessment provide the basis for selection of systems capable of meeting licensing requirements. Work has concentrated on specifying and testing natural and man-made materials which can be used to plug boreholes in basalt and which can be used as multiple barriers to surround nuclear waste forms and containers. The Engineered Barriers Program is divided into two major activities: multiple barrier studies and borehole plugging. 8 figures, 4 tables.

25138 **(RHO-C—50) Long-term creep of Hanford concrete at 250°F and 350°F. Final report.** Gillen, M. (Rockwell International Corp., Richland, WA (USA). Energy Systems Group). Oct 1980. Contract AC06-77RL01030. 22p. NTIS, PC A02/MF A01. Order Number DE81025583.

Test results described in this report cover approximately 21 months of testing in a program to examine the creep behavior of Hanford concretes at elevated temperatures. Two each of 6 x 12-in. concrete cylinders were subjected to static compressive loads of 500 psi at 350F and 1500 psi at 250F and 350F. Test cylinders were cast at Construction Technology Laboratories with materials and mix designs similar to those used in Hanford concrete structures. Effects of load and temperature on deformation of Hanford concrete were: (a) Increased static load reduced the amount of thermal strain when cylinders were heated above ambient. Free thermal expansion of Hanford cylinders heated to 350F was calculated to be about 850 millionths. However, strain of cylinders under 500 psi static load on heating averaged only 740 millionths. Expansion strain of specimens loaded to 1500 psi averaged only 530 millionths when heated to 350F. (b) At 350F, the magnitude of creep strain of cylinders increased with increased static load. Over equal test periods, creep strain of specimens loaded to 1500 psi was approximately twice as large as that of cylinders loaded to only 500 psi. (c) At a test load of 1500 psi, magnitude of creep strain increased with increased temperature. Specimens heated to 350F had creep strains about twice as large as those for specimens heated over comparable test intervals to only 250F. (d) Creep data were satisfactorily modelled with an expression of the form creep strain = A $\log_{10}$ (t) + B, where creep strain is in millionths, and t is time at test temperature, in days. Values for the coefficient, A, varied from 255.6 to 286.9. Magnitude of the constant B, ranged from 182.1 to 718.6. These trends are in general agreement with concrete creep behavior described in the literature.

25139 **(RHO-CD—80-615) Tank-farm-waste-volume projections.** Bendixsen, R.B. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Jun 1980. Contract AC06-77RL01030. 82p. NTIS, PC A05/MF A01. Order Number DE81024397.

Waste volume projections of solid and liquid tank farm wastes stored at Hanford were made in order to optimize usage of current and projected double shell tanks. Calculations of future waste volume projections indicate that 5 and 6 additional double shell tanks are needed to store, respectively, 18 and 20 million gallons of waste. Various alternate options are also being considered to further reduce the number of new tanks needed. Basic assumptions within the calculations include installation of a waste solidification facility for N Reactor dilute wastes, installing PN (Partial Neutralization) capability at 242-A and future operation (1983 to 1985) of the 242-S evaporator crystallizer facility for concentrating double shell slurry (DSS) feed for storage in Tank 102-SY.

25140 **(RHO-LD—49) Analytical models for simultaneous heat and moisture transport in soils.** Gibbs, A.G.; Baca, R.G. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Apr 1981. Contract AC06-77RL01030. 65p. NTIS, PC A04/MF A01. Order Number DE81025582.

Basic equations are derived to describe the transport of heat and moisture in soils, in response to gravity, capillarity, and temperature gradients. Appropriate boundary conditions are given for cases where surface evaporation is limited by atmospheric conditions or by diffusion rates in the soil. Some approximate techniques which lead to linear equations are described. Analytical solutions are derived for four linear models. Numerical evaluation of the analytical solutions, using the program MOIST, is described, and the results are compared to those generated by a finite element solution technique applied to the governing equations. Analytical and numerical results showed excellent agreement.

25141 **(RHO-SA—221) Electrical and electronic subsystems of a nuclear waste tank annulus inspection system.** Evenson, R.J. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Jun 1981. Contract AC06-77RL01030. 87p. NTIS, PC A05/MF A01. Order Number DE81025508.

The nuclear waste tank annulus inspection system is designed specifically for use at the Nuclear Regulatory Commission's Nuclear Fuel Services Facility at West Valley, New York. This system sends a television and photographic camera into the space between the walls of a double-shell nuclear waste tank to obtain

images of the inner and outer walls at precisely known locations. The system is capable of inspecting a wall section 14 ft wide by 27 ft high. Due to the high temperature and radiation of the annulus environment, the operating life for the inspection device is uncertain, but is expected to be at least 100 h, with 1000 R/h at 82°C. The film camera is shielded with 1/2 in. of lead to minimize radiation fogging of the film during a 25-min picture taking excursion. The operation of the inspection system is semiautomated with remote manual prepositioning of the camera, followed by a computer controlled wall scan. This apparatus is currently set up to take an array of contiguous pictures, but is adaptable to other modes of operation.

25142 **(SAND—80-1935) Elastic-plastic mechanical constitutive description for rock salt triaxial compression.** Butcher, B.M. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 52p. NTIS, PC A04/MF A01. Order Number DE81025889.

A model for the time-independent part of the mechanical deformation of rock salt from the Waste Isolation Pilot Plant Site in southeastern New Mexico is presented. A recently published creep model was first used to correct conventional triaxial compression data for time-dependent deformation. The experimental data was from tests at a loading rate of approximately 11.9 N/s, 23°C, and confining pressures from 0 to -20.7 MPa. The corrected time-independent curves were then used to determine material constants for the model. Generalization to a three-dimensional plasticity-failure theory using a general constitutive relation proposed by Rudnicki and Rice was also performed. 7 figures, 3 tables.

25143 **(SAND—81-0925) MARC calculations for the second WIPP structural benchmark problem.** Morgan, H.S. (Sandia National Labs., Albuquerque, NM (USA)). May 1981. Contract AC04-76DP00789. 99p. NTIS, PC A05/MF A01. Order Number DE81025250.

This report describes calculations made with the MARC structural finite element code for the second WIPP structural benchmark problem. Specific aspects of problem implementation such as element choice, slip line modeling, creep law implementation, and thermal-mechanical coupling are discussed in detail. Also included are the computational results specified in the benchmark problem formulation.

25144 **(WIPP-DOE—04) Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending February 28, 1979.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office; Sandia Labs., Albuquerque, NM (USA)). Mar 1979. 26p. NTIS, PC A03/MF A01. Order Number DE81023039.

WIPP in New Mexico is to serve as a repository for defense transuranic wastes, to provide an underground facility for in-situ experiments, and to demonstrate the disposal of spent fuel assemblies. This document summarizes the program management and the task and subtask activities for this month. (DLC)

25145 **(WIPP-DOE—05) Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending March 31, 1979.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office; Sandia Labs., Albuquerque, NM (USA)). Apr 1979. 24p. NTIS, PC A02/MF A01. Order Number DE81024993.

The Waste Isolation Pilot Plant is to serve as a nuclear waste repository for defense transuranic wastes, to provide an underground facility for in-situ experiments, and to demonstrate the disposal of spent fuel assemblies. This document summarizes the WIPP program management and its task and subtask activities. (DLC)

25146 **(WIPP-DOE—06) Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending April 30, 1979.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office; Sandia Labs., Albuquerque, NM (USA)). May 1979. 24p. NTIS, PC A02/MF A01. Order Number DE81024994.

The Waste Isolation Pilot Plant (WIPP) is to serve as a repository for defense transuranic wastes, provide an underground facility for in-situ experiments, and demonstrate the disposal of spent fuel assemblies. This document summarizes the WIPP program management and its task and subtask activities for this month. (DLC)

25147 **(WIPP-DOE—24) Waste Isolation Pilot Plant (WIPP). Project progress report for month ending May 31, 1979.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1979. 21p. NTIS, PC A02/MF A01. Order Number DE81024995.

To date, the Project has made good progress. All Geotechnical investigations have continued to support the acceptability of the WIPP Site. The preliminary design is nearing completion with planned Project completion 2 to 3 years ahead of other respositories. The Project Total Cost Estimate to complete will be available for Headquarter's review in early June. Preliminary indications are favorable. The Project team is nearly at full strength significantly increasing our technical expertise and management capability. The near term minor problems should not affect the long term performance.

25148 **(WIPP-DOE—25) Waste Isolation Pilot Plant (WIPP). Project progress report for month ending June 30, 1979.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1979. 20p. NTIS, PC A02/MF A01. Order Number DE81024996.

To date, the Project has made good progress. All geotechnical investigations have continued to support the acceptability of the WIPP Site. The preliminary design is nearing completion with planned Project completion 2 to 3 years ahead of other repositories. The Project Total Cost Estimate to complete was presented for Headquarter's review in early June, and was determined to be complete, technically well founded, innovative and realistic. The Project team is nearly at full strength significantly increasing our technical expertise and management capability. The near term minor problems should not affect the long term performance.

25149 **(WIPP-DOE—35) Waste Isolation Pilot Plant (WIPP). Project progress report for month ending July 31, 1979.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1979. 18p. NTIS, PC A02/MF A01. Order Number DE81024997.

To date, the Project has made good progress. All Geotechnical investigations have continued to support the acceptability of the WIPP Site. The preliminary design is nearing completion with planned Project completion 2 to 3 years ahead of other repositories. The Project Total Cost Estimate to complete was presented for Headquarter's review in early June, and was determined to be complete, technically well founded, and realistic. The Project team is nearly at full strength significantly increasing our technical expertise and management capability. The near term minor problems should not affect the long term performance.

25150 **(WIPP-DOE—36) Waste Isolation Pilot Plant (WIPP). Project progress report for month ending August 31, 1979.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1979. 18p. NTIS, PC A02/MF A01. Order Number DE81024998.

This report summarizes activities in the design, technical support, and scientific program of the Waste Isolation Pilot Plant. (DLC)

25151 **(WIPP-DOE—37) Waste Isolation Pilot Plant (WIPP). Project progress report for month ending September 30, 1979.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1979. 18p. NTIS, PC A02/MF A01. Order Number DE81024999.

This document summarizes activities in the design, technical support, and scientific program of the Waste Isolation Pilot Plant, which is to be located in New Mexico. (DLC)

25152 **(WIPP-DOE—74) Waste Isolation Pilot Plant. Project progress report for month ending August 31, 1980.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1980. 10p. NTIS, PC A02/MF A01. Order Number DE81021959.

The Waste Isolation Pilot Plant (WIPP) is intended to serve as a nuclear waste repository for those defense transuranic wastes, both remote handled and contact handled, which the Department of Energy (DOE) may designate as requiring deep geologic disposal. The WIPP will also provide a separate underground facility in which in-situ experments with various waste forms, including defense High-Level Waste (HLW) may be conducted. All the wastes placed into the WIPP for intended disposal would be retrievable for the period required to demonstrate the validity of the disposal concept. This period is not expected to exceed 10 years for TRU waste. Wastes used in the experimental program will be removed at the conclusion of the experiments.

25153 **(WIPP-DOE—75) Waste Isolation Pilot Plant. Project progress report for month ending September 30, 1980.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1980. 10p. NTIS, PC A02/MF A01. Order Number DE81023042.

The Waste Isolation Pilot Plant (WIPP) is intended to serve as a nuclear waste repository for those defense transuranic wastes and to provide a separate underground facility for in-situ experiments. This document summarizes activities in the WIPP design, technical support, and scientific program for this month.

25154 **(WIPP-DOE—76) Waste Isolation Pilot Plant. Project progress report for month ending October 31, 1980.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1980. 8p. NTIS, PC A02/MF A01. Order Number DE81023181.

The Waste Isolation Pilot Plant (WIPP) is intended to serve as a nuclear waste repository for those defense transuranic wastes, both remote handled and contact handled, which requires deep geologic disposal, and to provide a separate underground facility for in-situ experiments with various waste forms. Activities in the design, technical support, and scientific program of WIPP are summarized in this report. (DLC)

25155 **(WIPP-DOE—83) Waste Isolation Pilot Plant. Project progress report, November-December 1980.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1980. 11p. NTIS, PC A02/MF A01. Order Number DE81023367.

Developments in the design (Bechtel), technical support (Westinghouse), and scientific program (Sandia Labs.) of the Waste Isolation Pilot Plant are reported. (DLC)

25156 **(WIPP-DOE—84) Waste Isolation Pilot Plant. Project progress report, January 31, 1981.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1981. 9p. NTIS, PC A02/MF A01. Order Number DE81023366.

Progress in design (Bechtel), technical support (Westinghouse), and scientific program (Sandia) of the Waste Isolation Pilot Plant is reported. (DCL)

25157 **(WIPP-DOE—85) Waste Isolation Pilot Plant. Project progress report, February 28, 1981.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1981. 10p. NTIS, PC A02/MF A01. Order Number DE81023012.

The (WIPP) is intended for defense transuranic wastes and in-situ experiments. Activities on the WIPP design, technical support, and scientific program are summarized in this report. (DLC)

25158 **(WIPP-DOE—86) Waste Isolation Pilot Plant. Project progress report, March 31, 1981.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1981. 10p. NTIS, PC A02/MF A01. Order Number DE81023003.

NoneDesign, technical support, and scientific program activities for the Waste Isolation Pilot Plant in New Mexico are summarized. (DLC)

25159 **(WIPP-DOE—87) Waste Isolation Pilot Plant. Project progress report for month ending April 30, 1981.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). 1981. 9p. NTIS, PC A02/MF A01. Order Number DE81023363.

Purpose of the Waste Isolation Pilot Plant (WIPP) is to demonstrate the safe disposal of defense wastes. This document summarizes activities in the WIPP design, technical support, and scientific program. (DLC)

25160 **Geophysical techniques for selection, analysis and monitoring of waste disposal sites.** Robinette, M.S. (Univ. of Idaho, Moscow). pp 245-254 of Eighteenth annual symposium on engineering geology and soils engineering. Boise, ID; Boise State University (1980).

From 18. annual symposium on engineering geology and soils engineering; Boise, ID, USA (2 Apr 1980).

Groundwater contamination from waste disposal sites could be avoided with proper site analysis techniques. One of the major criterions for site selection should be the relative permeabilities at the site. In the case of hazardous waste disposal such as in uranium tailings operations, a waste disposal site should have extremely low permeability with no permeable hydrostratigraphic units included within the sequence which would carry contaminates away from the site. If it is not possible to find a site with these properties, then engineering safeguards must be designed into the waste disposal facility. In many cases, core recovery is not complete. In such cases, geophysical logs can provide a continuous in situ reading of subsurface parameters which affect seepage potential. Geophysical logs can be used as a very effective technology to eliminate the necessity of having to line an impoundment which is a very expensive operation. At other sites, the geophysical logs may indicate that lining is necessary because of the pressure of highly permeable units. Groundwater contamination from waste disposal operations could be avoided with proper site analysis techniques. Contamination from disposal sites is carried down-gradient within permeable hydrostratigraphic units which can be located and delineated with a combination of drill holes, borehole geophysical logs, and surface geophysics. These same techniques are useful in the assessment and delineation of existing contaminate plumes and provide cost-effective data for the design of withdrawal wells in the affected area.

25161 **Department of Energy waste management program by the Office of Nuclear Waste Management.** Meyers, S. (DOE, USA). pp vp of Atomic Industrial Forum, Inc. fuel cycle conference, 1979. Bethesda, MD; At Ind Forum, Inc (1979).

From Atomic Industrial Forum fuel cycle conference; Atlanta, GA, USA (11 Mar 1979).

The purpose of this information paper is to discuss the nuclear waste management program of the Department of Energy (DOE) including the effect of the recent report of a Presidentially-appointed Interagency Review Group (IRG) on the program. The paper summarizes the historical background of some key issues relating to nuclear wastes; lists the major recommendations of the IRG report; and reviews the elements of the DOE program and the changes which might be made as a result of the IRG report.

25162 **(WIPP-DOE—43) Public information plan for the Waste Isolation Pilot Plant Project.** (USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office). [nd]. 16p. NTIS, PC A02/MF A01. Order Number DE81023065.

Objectives of this plan are to assure the capability to provide updated and understandable information on all aspects of the WIPP project, including scientific, technical, environmental, and socio-economic information. This document outlines the scope and applicability, responsibilities, procedures, and actions. (DLC)

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 25110, 25111, 25112, 25113, 25114, 25115, 25116, 25118, 25124, 25970, 26161, 26165, 26197, 26198, 26291, 26320

25163 (CONF-801155—6) Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill. Rayno, D.R.; Momeni, M.H.; Sabau, C. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 13p. NTIS, PC A02/MF A01.

From 3. annual symposium on uranium mill tailings management; Ft Collins, CO, USA (24 Nov 1980).

Radiochemical analysis was performed on samples of soil and eight species of common vegetation growing on the Anaconda uranium mill site, located in New Mexico. The concentrations of the long-lived radionuclides U-238, U-234, Th-230, Ra-226, and Pb-210 in these forage plants were determined. The sampling procedures and analytical laboratory methods used are described. The highest radionuclide concentration found in a forage species was 130 pCi of Ra-226 per gram dry weight for grass growing on the main tailings pile at Anaconda, where the surface soil activity of Ra-226 was 236 pCi/g. A comparison of shoots activity with that of roots and soil was used to determine a distribution index and uptake coefficient for each species. The distribution index, the ratio of root activity to shoot activity, ranged from 0.30 (Th-230) in galleta grass (Hilaria jamesii) to 38.0 (Ra-226) in Indian ricegrass (Oryzopsis hymenoides). In nearly all instances, the roots contained higher radionuclide concentrations. The uptake coefficient, the ratio of vegetation activity to soil activity, ranged from 0.69 (U-238) in Indian ricegrass roots to 0.01 (U-238) in four-wing saltbush (Atriplex canescans) shoots. The range of radionuclide concentrations in plants growing on the Anaconda mill site is compared to that in vegetation from a control site 20 km away.

25164 (CONF-8010130—8) Americium migration in basalt and implications to repository risk analysis. Rickert, P.G. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 16p. NTIS, PC A02/MF A01. Order Number DE81023850.

From Waste-Rock Interactions Technology annual information meeting; Seattle, WA, USA (13 Oct 1980).

Experiments were performed with americium as a minor component in groundwater. Batch adsorption, migration through column, and filtration experiments were performed. It was determined in batch experiments that americium is strongly adsorbed from solution. It was determined with filtration experiments that large percentages of the americium concentrations suspended by the contact solutions in batch experiments and suspended by the infiltrating groundwater in migration experiments were associated with particulate. Filtration was determined to be the primary mode of removal of americium from infiltrating groundwater in a column of granulated basalt (20 to 50 mesh) and an intact core of permeable basalt. Fractionally, 0.46 and 0.22 of the americium component in the infiltrating groundwater was transported through the column and core respectively. In view of these filtration and migration experiment results, the concept of K/sub d/ in the chromatographic sense is meaningless for predicting americium migration in bedrock by groundwater transport at near neutral pH.

25165 (PNL—3789) Assessment of effectiveness of geologic isolation systems: geostatistical modeling of pore velocity. Devary, J.L.; Doctor, P.G. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 45p. NTIS, PC A03/MF A01. Order Number DE81023699.

A significant part of evaluating a geologic formation as a nuclear waste repository involves the modeling of contaminant transport in the surrounding media in the event the repository is breached. The commonly used contaminant transport models are deterministic. However, the spatial variability of hydrologic field parameters introduces uncertainties into contaminant transport predictions. This paper discusses the application of geostatistical techniques to the modeling of spatially varying hydrologic field parameters required as input to contaminant transport analyses. Kriging estimation techniques were applied to Hanford Reservation field data to calculate hydraulic conductivity and the ground-water potential gradients. These quantities were statistically combined to estimate the groundwater pore velocity and to characterize the pore velocity estimation error. Combining geostatistical modeling techniques with product error propagation techniques results in an effective stochastic characterization of groundwater pore velocity, a hydrologic parameter required for contaminant transport analyses.

0540 Health And Safety

REFER ALSO TO CITATION(S) 25111, 25117, 25118, 25124, 26317, 26319

25166 (CONF-801038—23) Method for estimating the challenge to an air-cleaning system resulting from an accidental explosive event. Steindler, M.J.; Seefeldt, W.B. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01. Order Number DE81023817.

From 16. DOE nuclear air cleaning conference; San Diego, CA, USA (20 Oct 1980).

A method is presented for determining the challenge to an air cleaning system resulting from an accidental explosion in a process cell of a fuel cycle facility. In many safety analyses, this quantity is estimated by multiplying the volume of the process cell by the maximum concentration of airborne material that is reasonably stable to agglomeration and sedimentation. Particle sizes are inferred from the assumption of concentration stability. The suggested method is based on extrapolation of data obtained for the explosive dispersal of chemical agents. Application of the extrapolated information to fuel cycle facilities results in an estimate of total material airborne as well as particle size distribution. An important variable is the weight ratio of inert material to that of explosive (mass ratio). As the mass ratio is expected to be high in fuel cycle facilities, the method predicts that airborne material will have size distributions that have relatively large mean values following which substantial settling will occur. An illustrative calculation that takes mass ratio and settling into account suggests that total filter challenge may be greater than previously estimated, but that the fraction of that challenge that is smaller than 10 micro-meters may be very low. For use in safety analyses, the method requires experimental validation of the extrapolation of reference data to the conditions existing in a fuel cycle facility.

25167 (CONF-801217—, pp 283-301) **Overview of EPA's health risk assessment model for the shallow land disposal of LLW.** Meyer, G.L.; Hung, C.Y. (Environmental Protection Agency, Washington, DC). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

EPA is developing a generally applicable environmental standard for managing and disposing of LLW as part of the National Radioactive Waste Management Program. To support the LLW standard, EPA will assess potential impacts from disposing of LLW by a number of alternatives including estimating potential releases to the environment, doses, health risks and costs from eight land disposal methods. This paper presents an overview of EPA's assessment model for shallow land disposal (SLD) of LLW. It describes model design considerations, conceptual design of model and approach to developing model. The SLD model has data preparation and main calculational sections. The main calculational section has release, transport and dose/health submodels including leaching, release, groundwater transport, surface water transport, atmospheric transport, resuspension, irrigation, operational spillage, human intrusion, biological uptake by man, dose and health risk submodels. Where possible, existing models/submodels were used. However, new submodels were developed for infiltration, leaching, release and groundwater transport. Basic system equations and brief explanations of these four submodels are given.

25168 (CONF-801217—, pp 327-331) **Systems model for evaluating population dose from low-level waste activities.** Stoddard, J.A.; Lester, D.H. (Science Applications, Inc., LaJolla, CA). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

This paper briefly describes a computer code developed to evaluate population dose or maximum individual dose from the various activities associated with shallow land burial of low-level wastes. The code, called BURYIT, treats a wide variety of scenarios to determine the effects of various parameters associated with

siting, packaging and burial procedures on potential public exposure. In the analysis of radionuclide dispersal, BURYIT treats unsaturated zone seepage, aquifer transport, wind erosion and atmospheric transport. Population exposure pathways considered include direct exposure to undispersed wastes, direct exposure to contaminated air, direct exposure to contaminated ground, inhalation of contaminated air, and ingestion of contaminated food, water and milk.

25169 **(RFP—3159) Risk comparison of centralizing or decentralizing processing facilities for defense transuranic waste.** Brown, C.M. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). Mar 1981. Contract AC04-76DP03533. 62p. NTIS, PC A04/MF A01. Order Number DE81024409.

This study is part of a set of analyses under direction of the Transuranic Waste Management Program designed to provide comprehensive, systematic methodology and support necessary to better understand options for national long-term management of transuranic (TRU) waste The report summarizes activities to evaluate the risks of possible alternatives in locating facilities to process DOE-managed transuranic waste. The options considered are: facilities located at all major DOE TRU waste generating sites; two or three regional facilities; and central processing facility at only one DOE site. The study concludes that the radiological risks from any processing facility siting alternative are small and would not prohibit processing at any DOE site. The study shows that central, regional, or individual site processing are roughly equivalent options based on environmental risk although some reduction in risk is possible with individual site processing because of reduced transportation requirements.

25170 **(UCRL—85458) Evaluation of the seismic integrity of a plutonium-handling facility.** Coats, D.W. (Lawrence Livermore National Lab., CA (USA)). 4 Feb 1981. Contract W-7405-ENG-48. 8p. (CONF-810801—4). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Many studies have been made by and for the Lawrence Livermore National Laboratory (LLNL) to ensure the seismic safety of its Plutonium Facility (Building 332). These studies have included seismological and geologic field investigations to define the actual seismic hazard existing at the Laboratory site as well as structural studies of the Facility itself. Because the basic seismic design criteria has undergone changes over the years, numerous structural studies and upgrades have been completed. The seismic criteria in use at the LLNL site is reviewed on a continuing basis as new information on the seismicity and geology of the Livermore Valley is obtained. At present, the Laboratory's Earth Sciences Division is conducting a multi-million dollar program to identify and characterize the geologic hazards at the Livermore site, with the primary emphasis on earthquake hazards in the Livermore Valley. This effort is undergoing an independent review by Woodward-Clyde Associates. Additionally, because of increased concerns over the seismic safety of Building 332, the Laboratory has initiated an independent structural review. This review effort will be monitored by the California Seismic Safety Commission to ensure its independence. Both of these studiies are in their early stages and results.are not yet available.

25171 **(UCRL—85460) Impact of the January-February 1980 earthquake sequence on various structures at the Lawrence Livermore National Laboratory.** Murray, R.C.; Nelson, T.A.; Coats, D.W.; Ng, D.S.; Weaver, H.J. (Lawrence Livermore National Lab., CA (USA)). 4 Feb 1981. Contract W-7405-ENG-48. 14p. (CONF-810801—5). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

On January 24, 1980, California's Livermore Valley was rocked by a moderate earthquake that caused some damage to the Lawrence Livermore National Laboratory (LLNL). The earthquake, which measured 5.5 on the Richter scale and was centered about 20 km (12 mi) northwest of the Laboratory, produced estimated peak horizontal ground acceleration at LLNL of between 0.15 and 0.3 g. The earthquake was part of a sequence that included two sharp aftershocks (magnitudes 5.2 and 4.2) within 1.5 minutes of the initial event. A second earthquake (magnitude 5.8) struck on January 26, and several lesser earthquakes occurred during the next few weeks. This paper describes the damage impact of the January 24 earthquake, including: background information on LLNL, discussion of pre-earthquake seismic safety philosophy, and description of the impact of the January 24 earthquake, including a description of the seismic setting of the Laboratory, a discussion of the ground motion, and a summary of damage. This paper also describes a data gathering and reduction effort at LLNL in the aftermath of the January earthquakes.

0550 Regulations

REFER ALSO TO CITATION(S) 25106, 25107, 25109, 25969

25172 **(K/OA—5001) Hexapartite safeguards project team 3: material accounting and control questionnaire.** Swindle, D.W. Jr. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 16 Jun 1981. Contract W-7405-ENG-26. 29p. NTIS, PC A03/MF A01.

Information provided in this report reflects the current design and operating procedures for the GCEP. However, since the installation is currently under construction, facility design and operating procedures discussed in this report are subject to change. Where applicable, the responses are based on material control and accounting practices of the Portsmouth Gaseous Diffusion Plant's (GDP) operating contractor (Goodyear Atomic Corporation). These practices meet US Department of Energy (DOE) standards and are assumed to be the reference practices for the GCEP. This report covers data collection and record keeping actions of the operator.

25173 **(SAND—81-0586C) Guide to the design of physical protection systems for light water reactors.** Martin, F.P. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 2p. (CONF-810706—4). NTIS, PC A02/MF A01.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

In early 1978, US DOE organized, in cooperation with IAEA and NRC, an inter-regional training course on the physical protection of nuclear facilities and materials. DOE directed Sandia National Laboratories to prepare and conduct the course in Albuquerque, New Mexico. Shortly after the evolution of this training program, the Agency directed DOE to develop a Guide to the Design of Physical Protection Systems for Light Water Reactors. A draft of the Guide was prepared by Sandia and is based on selected materials developed for and used in the physical protection training course. The Guide emphasizes the need for systematic approach to the design and evaluation of physical protection systems, discusses light water reactor vulnerabilities, outlines a method of threat analysis and discusses the characteristics of a broad spectrum of hardware available for use in physical protection systems. This report is a brief description of the guide.

25174 **(UCRL—53145) Portable computer to reduce gamma-ray spectra for plutonium isotopic ratios.** Ruhter, W.D.; Camp, D.C. (Lawrence Livermore National Lab., CA (USA)). 15 May 1981. Contract W-7405-ENG-48. 36p. (ISPO—134). NTIS, PC A03/MF A01. Order Number DE81025782.

In response to Task A.63 of the International Safeguards Project Office (ISPO), to upgrade measurement technology used by the International Atomic Energy Agency (IAEA), a portable data-reduction microprocessor was designed and programmed which allows in-field reduction of gamma-ray spectra and interfaces with the IAEA's multichannel analyzers - the 1000 or 2000-channel memory Silena BS27/N. This report describes the components used in assembling the microprocessor unit: hardware, software used to control the unit, and the mathematical formulation used to obtain isotopic ratios from the gamma-ray data. A simple overview is presented of the unit's operation and the results of tests on gamma-ray spectra that sought to verify the unit's operating characteristics and to determine the precision and effectiveness of the software developed for data reduction.

06 Properties

REFER ALSO TO CITATION(S) 26577

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0702 Radiation Sources

REFER ALSO TO CITATION(S) 26085

25175 **(CONF-801111—45) Pulsed neutron sources for condensed-matter research.** Price, D.L. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023806.

From 6. conference on application of accelerators in research and industry; Denton, TX, USA (Nov 1980).

The efforts around the world to provide higher neutron intensities are now focussed on accelerator-driven spallation sources in which neutrons are produced by bombardment of heavy metal targets with high energy protons. Spallation sources can be pulsed or quasi-continuous depending on the nature of the proton accelerator. Pulsed spallation sources, based on rapid cycling synchrotrons or storage rings, are especially attractive since a moderate average proton current (10^{-5} - 10^{-3}A) can produce high instantaneous neutron intensities which can be used with time-of-flight methods to provide powerful neutron spectrometers.

08 HYDROGEN

0801 Production

REFER ALSO TO CITATION(S) 25266, 26000

25176 **(CONF-800616—10) Substantive improvement of the thermal efficiency of the mercury-iodine thermochemical cycle ANL-4.** Appelman, E.H.; Abraham, B.M.; Basile, L.J.; Richards, R.R.; Schreiner, F. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023573.

From 3. world hydrogen energy conference; Tokyo, Japan (23 Jun 1980).

The mercury-iodine thermochemical cycle ANL-4 has been improved by the use of pure water instead of aqueous isopropanol as the solvent for the low temperature, water-binding step, $H_2O + NH_3 + CO_2 + KI \rightarrow KHCO_3 + NH_4I$. The modification reduces the amount of energy required to isolate the NH_4I formed in this reaction and increases the overall thermal efficiency of the cycle to about 31%, based on ΔG of formation of liquid water.

25177 **(LA-UR—81-1050) Improved efficiency in the sulfur dioxide-iodine hydrogen cycle through the use of magnesium oxide.** Mason, C.F.V.; Bowman, M.G. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810812—8). NTIS, PC A02/MF A01. Order Number DE81017361.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The reaction of iodine with dry magnesium oxide and magnesium sulfite hexahydrate was studied experimentally as a possible means of improving the efficiency of the sulfur dioxide-iodine cycle. When no extra water was introduced, the maximum product yield was 67% obtained at 423 K. With excess water vapor, a nonporous plug was formed which prevented complete reaction. In the second case, maximum yield was 62% measured at 433 K showing that added water does not increase reaction products. This reaction gives an alternate route for producing hydrogen from water via the sulfur dioxide-iodine process.

0803 Transport

25178 **(SAND—81-8006) Hydrogen compatibility of structural materials for energy storage and transmission. Final report.** Hoover, W.R.; Robinson, S.L.; Stoltz, R.E.; Spingarn, J.R. (Sandia National Labs., Livermore, CA (USA)). May 1981. Contract AC04-76DP00789. 64p. NTIS, PC A04/MF A01. Order Number DE81023676.

The results are summarized of our six-year program investigating the hydrogen compatibility of structural materials for energy storage and transportation, a program which focused on the feasibility of using the natural gas pipeline network for hydrogen gas transmission. To answer the compatibility and feasibility questions a variety of dynamic and static tests were used: tensile, fracture toughness, and bursts tests of typical pipeline steels and welds, and sustained-load tests on a model pipeline. The results reveal that the toughness of pipeline materials in hydrogen is degraded up to 30% and the burst strength of flawed pipes containing hydrogen decreases by 15 to 20%. Hydrogen-assisted fatigue crack growth is rapid and there is sustained-load cracking in the heat-affected zones of welds. While it may be feasible to transport hydrogen in the natural gas pipeline network, the maximum allowable working pressure will likely have to be decreased. The extent of this decrease depends on the results of additional slow-crack-growth and fatigue-crack-growth studies. The magnitude of this decrease would have a direct bearing on the economic desirability of transporting hydrogen gas through natural gas pipelines.

0808 Properties

REFER ALSO TO CITATION(S) 25178

09 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 24851, 24868, 24901, 24902, 25194, 25254, 25255, 25280, 25284, 25290, 25291, 25292, 25339, 25409, 25844, 25845, 25892, 26095

25179 **(CONF-801210—26) Enhancement of methane gas production using an industrial waste in anaerobic digestion.** Fradkin, L.; Kremer, F. (Argonne National Lab., IL (USA); ESCOR, Inc., Northfield, IL (USA)). 1980. Contract W-31-109-ENG-38. 10p. NTIS, PC A02/MF A01. Order Number DE81023819.

From 3. Miami international conference on alternative energy sources; Miami Beach, FL, USA (15 Dec 1980).

One method of recycling that may aid in the solution of the current energy problems is anaerobic digestion. Chromium shavings are a solid waste produced by the leather tanning industry. Chromium can block enzymatic systems or interfere with essential cellular metabolites of most oxidizing bacteria. In general, heavy metals coagulate and precipitate proteins, many of which are denatured by this action. This study examines the effects on anaerobic digestion of chromium shavings from leather tanning. Leather chrome shavings contain proteins, nitrogen, and fats. These shavings were added to two of three digesters at various rates. The methane gas production of the experimental units improved significantly compared to the control. In addition, the presence of a toxic loading or change of feed had no harmful effect on the digester performance.

25180 (CONF-7909198—, pp 535-557) **Main research topics in the Department of Waste Management of the University of Stuttgart and a report on current investigations of practical interest concerning landfill gas.** Tabasaran, O. (Univ. of Stuttgart, Germany). 1979. NTIS (US Sales Only), PC A99/MF A01.

From International trade fair on recycling, refuse collection and waste treatment; Jonkoping, Sweden (17 Sep 1979).

A short review is first given of the main current research topics in the Department of Waste Management of the University of Stuttgart, followed by a report on current investigations on man-

agement of landfill gas, in which particular attention is paid to problems, origin, quantity and composition, properties, possible risks, deodorizing, and technical management. Finally a new suggestion is made for natural de-gassing of landfills by means of large-surface filters. 7 figures, 2 tables.

25181 **(DOE/CE/20098—1) Engineering economic analysis of biomethanation of pyrolysis gas.** (Dynatech R/D Co., Cambridge, MA (USA)). Jun 1981. Contract AC01-78CS20098. 250p. NTIS, PC A11/MF A01. Order Number DE81025849.

A detailed engineering economic analysis was carried out for the biomethanation of pyrolysis gas produced from municipal solid waste by the PUROX process. Biomethanation is defined in this analysis as the shift conversion of CO to CO_2 and H_2 and the methanation of CO_2 and H_2 by select anaerobic microorganisms. The biological reactions occur in the liquid phase of the reactor. A model of the biomethanation process was developed, incorporating material and energy balances, biological reaction kinetics, mass transfer rates, capital and operating costs, and utility financing cost analysis. A computer program of this model was employed to examine the sensitivity of unit gas cost to varying operating and design parameters. Designs were developed for sequential biological shift conversion reactors followed by biological methanation reactors, and for reactors in which both biological reactions occur simultaneously. This analysis yields unit gas costs for biomethanation of pyrolysis gas of $2 and $1/10^6$ Btu for the sequential and simultaneous biological reaction designs, respectively. Engineering cost estimates for the PUROX pyrolysis of solid waste, and catalytic methanation of the resulting pyrolysis gas, and costs for anaerobic digestion of municipal solid waste, and purification of the resulting gas, were obtained from the literature. These analyses were combined with the economic analysis developed for biomethanation to provide a comparison of four systems for conversion of municipal solid waste to methane: anaerobic digestion; PUROX pyrolysis followed by catalytic methanation; PUROX pyrolysis followed by simultaneous biological shift conversion and methanation.

25182 **(DOE/CS/40177—T2) COthane, methane from waste CO. Final technical report.** Rabo, J.A.; Frost, A.C.; Elek, L.F.; Risch, A.P.; Yang, C.L. (Union Carbide Corp., Tarrytown, NY (USA). Tarrytown Technical Center). Dec 1980. Contract AC03-78CS40177. 117p. NTIS, PC A06/MF A01. Order Number DE81023246.

As the result of early efforts in the fields of catalysis, coal gasification, and methanation, Union Carbide developed a novel process for the direct concentration and conversion of CO in dilute waste streams to high quality methane (SNG). This two bed, two step process was dubbed COthane, a contraction of the feed carbon monoxide (CO) and the product methane. The objectives of this contract were to develop the COthane process up to the large pilot plant stage, to develop an improved catalyst, and to estimate the cost of methane produced by this process. The process development studies yielded all of the design parameters required to design a large scale pilot plant, the catalyst development program produced a catalyst with promising stability, and the economic studies showed that methane production cost would generally be more than $6/MM BTU. Because this cost is above those for natural gas, further work on this project has been suspended until rising natural gas prices catch up with the more slowly rising COthane production cost.

25183 **Thermal conversion of solid wastes and biomass.** Jones, J.L.; Radding, S.B. (eds.). Washington, DC; America Chemical Society (1980). 761p. (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

This 49 chapter book contains papers presented at a symposium on energy recovery from thermal conversion of solid wastes and agricultural and forestry residues. There are 9 sections which cover the worldwide status of pyrolysis, gasification, and liquefaction processes. Separate abstracts of each chapter have been prepared for inclusion in the Energy Data Base.

25184 **(PB—81-110959) Pyrolytic oils - characterization and data development for continuous processing. Report for Jun 76-Mar 80.** Knight, J.A.; Elston, L.W.; Hurst, D.R.; Kovac, R.J. (Georgia Inst. of Tech., Atlanta (USA). Engineering Experiment Station). Aug 1980. 199p. NTIS, PC A09/MF A01.

Pyrolytic oils produced by the pyrolysis of forestry residues in a vertical bed, countercurrent flow reactor have been thoroughly characterized. The pyrolytic oils were produced in a 500-lb. per hour pilot plant and in a 50-ton per day field development facility. The overall chemical and physical properties have been determined by standard analytical techniques. The oils are dark brown to black with a burnt, pungent odor and have a boiling range of about 100C to approximately 200C at which point thermal degradation begins to occur. Pyrolytic oils contained phenolics, polyhydroxy neutral compounds and volatile acidic compounds.

25185 **(SERI/PR—622-1153) Gasification engineering. Quarterly report, January-March 1981.** Derosiers, R.; Richey, G. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 47p. NTIS, PC A03/MF A01.

The goal of the work described here is to develop a simulation of the processes occurring in biomass gasifers of sufficient detail to assist in the design of fixed bed gasification equipment. Work to date has focused on a contercurrent (updraft) fixed-bed reactor because, when operated in this mode, the individual processes under study are spatially separated in the bed. Eventual application to a pressurized, cocurrent, fixed bed is planned. The system designed to obtain steady-state operating data, including composition profiles, was assembled during the summer of 1980 and completed in late August. Several months were expended solving feeding and sampling problems, but we now have an operable system and have obtained the required data for a limited number of cases. All the runs reported were made with densified wood pellets. The overall mass balance results have been correlated with a simplified pyrolysis model. The composition profiles have been simulated by integrating differential mass and energy balances through the bed.

25186 **Thermochemical gasification of woody biomass.** Feldmann, H.F.; Choi, P.S.; Conkle, H.N.; Chauhan, S.P. (Battelle Columbus Lab., Columbus, OH). *ACS (American Chemical Society) Symposium Series ;* No. 144, 351-375(1981). (CONF-790415—P8).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The effects of gasification parameters for both catalyzed and raw wood in gasification experiments with hydrogen, hydrogen/steam, and steam are described. Calcium oxide, calcium carbonate, and wood ash were used as catalysts. Experimental results indicate that steam is a more effective gasification agent for wood than hydrogen. Steam gasification proceeds at a higher rate resulting in a greater net Btu recovery in the product gas. When incorporated into pelletized wood, wood ash and calcium oxide are both effective in increasing carbon conversion and net Btu recovery. Wood ash is effective for both hydrogen and steam gasification while calcium oxide seems more effective in steam than in hydrogen atmospheres. In addition, calcium carbonate was found to increase organic liquid product formation. Methane concentrations in excess of that predicted by thermodynamic equilibrium were achieved over the entire range of hydrogen/steam ratios and pressures studied.

25187 **Refuse conversion to methane (RefCOM): a proof-of-concept anaerobic digestion facility.** Walter, D.K.; Brooks, C. (US DOE). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Power Apparatus and Systems ;* **PAS-99**: No. 6, 2363-2368(Nov-Dec 1980).

Known as RefCOM--Refuse Conversion to Methane--the DOE experimental facility in Florida can process 100 tons of raw refuse per day with an output as high as 700,000 cubic feet of gas (CH/sub 4/ and CO/sub 2/) per day. Based on an average home gas consumption of one million cubic feet per year, a 1,000 tons-per-day plant has the potential to meet the gas needs of over 7,000 homes. The objectives of the RefCOM experiment are to: establish information on the quality and quantity of gas produced; ascertain optimum operating parameters for both mesophilic and thermophilic modes; and evaluate the reliability of the techniques.

25188 PUROX system demonstration test on simulated Japanese refuse. Masuda, T. (Showa Denko K.K., Tokyo, Japan); Fisher, T.F. *ACS (American Chemical Society) Symposium Series ;* No. 130, 573-586(1980). (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

Using the PUROX System pilot plant of Union Carbide located at Tonawanda, New York, USA, a demonstration test was conducted on simulated Japanese refuse from June through August, 1978, after making some modifications of the plant. The purpose of the demonstration was to achieve the following three objectives: (1) conduct tests on simulated Japanese refuse and thereby collect additional data to supplement those obtained on US refuse, in order to obtain the technical approval of the Ministry of Health and Welfare (MHW) of Japan for the PUROX System; (2) analyze in accordance with procedures provided in the Japanese Industrial Standard or those established by the Environment Agency and MHW of Japan, in order to evaluate outgoing streams on the basis of Japanese national environmental standards and emission and effluent standards; and (3) obtain engineering data necessary for the design of the components of the Dry Process, namely, the gas combustor, waste heat boiler, and electrostatic precipitator. The results of the pilot tests are presented. The economics of the PUROX system are also discussed.

25189 Integrated system for solid waste disposal with energy recovery and volumetric reduction by a new pyrolysis furnace. Fujii, T. (Hitachi Shipbuilding & Engineering Co., Ltd. Osaka, Japan). *ACS (American Chemical Society) Symposium Series ;* No. 130, 587-601(1980). (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

The system primarily consists of four processes, shaft furnace gasifier with rotary grate, ash melting furnace, combustor of product gases and turbo-power generator for energy recovery. The aims of this system are to reduce residue volume, assure stabilized and pollution-free operation and enable the recovery of useful resources. Combustible product gases produced from the gasifier are directly burnt in a recombustion boiler with moderate amount of air for power generation. Furthermore, the residues are melted into the slag in the ash melting furnace. This paper describes such newly developed integrated solid waste disposal systems. The test results applying the gasifier to the processing of municipal refuse and scrap tires with solid waste are presented. The fundamental characteristics of this plant such as installation space, capital cost and operating cost are discussed.

25190 Conversion of forest residues to a clean gas for fuel or synthesis. Feldman, H.F.; Liu, K.T.; Longanbach, J.R.; Curran, L.M.; Chauhan, S.P. (Batelle, Columbus Lab, Ohio). pp 81-89, Book 1 of TAPPI engineering conference proceedings: books 1 through 3, 1979. Atlanta, GA; TAPPI (1979).

From General Electric colloquium; Schenectady, NY, USA (29 Nov 1979).

Two novel developments are described that have the potential to reduce the cost of gas from forest residues or other biomass materials. The first of these is the finding that wood ash itself enhances wood's gasification reactivity. The second development is the application of a novel reactor system that allows a wide range of forest residues ranging from sawdust to wood chips to be gasified at high throughputs without preprocessing such as grinding or pelletizing. Results of a preliminary cost evaluation indicate that a clean transportable gas suitable for either chemical synthesis or fuel can be produced at a cost competitive with other clean fuels. 3 refs.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 24868, 25280, 25291, 25406, 25885, 25886, 25887, 25889, 25890

25191 (DOE/AF/92003—1) Gasohol by direct extraction of aqueous ferments. Interim progress report No. 1. Ross, J.F. (Department of Energy, Chicago, IL (USA). Chicago Operations Office). 30 Apr 1981. 32p. NTIS, PC A03/MF A01. Order Number DE81023293.

Progress is reported in the direct extraction of ethanol by lead-free gasoline from mash obtained by fermenting corn. It was found that a significant volume of non-volatile material, protein or carbohydrate in nature, was extracted along with the ethanol. By distilling the aqueous part of the mash prior to extraction, no non-volatile material is extracted and the resulting fuel is suitable for use in an internal combustion engine. Energy requirements with the modification are not changed. Higher temperature extracions appear to offer process advantges over lower temperature extractions. Laboratory continuous counter-current extractions are required to obtain engineering data needed for scale-up to pilot plant scale. (DMC)

25192 (DOE/R5/10131—2) Enzymatic conversion of crop residue to glucose and alcohol. (Canby Area Vocational Technical Inst., MN (USA)). 31 Jan 1981. Contract FG02-79R510131. 20p. NTIS, PC A02/MF A01. Order Number DE81023346.

The consistent production of high quality cellulase enzyme on a pilot plant scale was the major objective on the Canby Area Vocational Technical Institute Alcohol Fuel Program. The applied research is patterned after the basic research conducted by the US Army Natick Research and Development Command in Natick, Massachusetts. Other objectives were to determine the minimum equipment required to build this plant, the cost of this equipment and the production cost of one gallon of ethanol. The cellulase enzyme was used to hydrolyze celluloses to fermentable sugars. Cellulase production on a laboratory scale has been successfully studied with submerged fermentations of the cellulotytic fungus Trichoderma. The production of high quality enzyme was the key to this project. Once consistent and reproducible high quality enzyme yields were achieved, it would then be possible to evaluate the conversion of waste cellulose to ethanol.

25193 (DOE/R5/10217—1) US Department of Energy midwest appropriate technology small grants program. Semi-annual technical progress report. (Stelle Group, IL (USA)). 3 Apr 1981. Contract FG02-80R510217. 54p. NTIS, PC A04/MF A01. Order Number DE81025064.

This report describes progress made to date by The Stelle Group on their Appropriate Technology Grant Project titled Developing a Process-Plant Design Package for Cooperative Level Production of Fuel Grade Ethanol. Accompanying the description of progress is also explanation of changes made or recommended in the technical and budget aspects of the project, while maintaining the integrity of the original project goal and approach. At present, the project appears to be about six weeks behind schedule, but it is expected that project completion will only be about four weeks behind the originally intended target date. The described pilot phase of the project is within several weeks of completion. At that point, all data gathered will be analyzed and the final design phase will begin.

25194 Hybrid biothermal conversion of biomass to liquid fuels. Jerger, D.E.; Srivastava, V.J.; Daniels, E.; Novil, M.; Tarman, P.B.; Chynoweth, D.P. Chicago, IL; Inst. of Gas Technology (1981). 19p. (CONF-810380—1).

From Biogas and alcohol fuels seminar; Chicago, IL, USA (12 Mar 1981).

A description of the BIOTHERMOHOL Process developed at IGT is presented in this report. This process effectively combines fermentation and thermochemical gasification for conversion of biomass to liquid fuels. The advantages of using this combination over separate fermentation and thermochemical gasification processes are: (1) wet or dry feeds can be processed; (2) nutrients for biological conversion can be minimized by recycle from the thermochemical conversion process; (3) thermal efficiency is high; (4) process residues are decreased; and (5) greater flexibility is allowed in feed requirements and operating conditions. The results of a systems analysis to determine the feasibility of the process are included. Two applications are cited - corn feedstock and sugar cane feedstock hypothetical plants. Results of the systems analyses indicate that the BIOTHERMOHOL process is an effective and efficient means for obtaining a substantial energy benefit, reducing process residues and providing a long-term source of liquid fuels at high yields. A preliminary economic analysis indicates the process could be competitive at current market prices. (DMC)

25195 **(PB—81-112641) Farm and cooperative alcohol plant study: technical and economic assessment as a commercial venture.** (Katzen (Raphael) Associates, Cincinnati, OH (USA)). Oct 1980. Contract NAFC-T-16076549. 241p. NTIS, PC A11/MF A01.

The objective of the study is to evaluate the technical and economic feasibility of producing motor fuel grade (MFG) ethanol in smaller plants amenable to a farm or cooperative operation. Several parameters are explored as follows: six agricultural locations; three plant sizes of 90,000, 300,000, and 900,000 gallons per year; five feedstocks; ethanol proof levels of 190 and 199; and byproduct distillers grains either as whole stillage or prepared by various degrees of drying. Plants were assumed to operate only 6000 hours per year (sugar beets only 3600 hours) because of limitations of time (or beet feedstock). Locally available boiler fuels were chosen. Simplified processing was identified so as to be realistically within the time and experience available to a farmer-operator. The most attractive case used Indiana corn in a 900,000 gallon plant making 190 proof ethanol, and selling whole stillage (no dewatering or drying). Plant investment for this best case as well as several option combinations is given. The selling price of the best case 190 proof ethanol at 20% IROR was $1.79 based on $2.70 corn.

25196 **Modified kit procedure for the kinetic assay of ethanol.** Bostick, W.D.; Overton, J.B. (Oak Ridge Natl Lab, Tenn). *Biotechnology and Bioengineering ;* **22**: No. 11, 2383-2392(Nov 1980).

The utility of a commercial kit procedure for the determination of ethanol was examined, based upon its enzymatic oxidation and the concurrent production of NADH, monitored by photometry at 340 nm. It is found that the equilibrium production of NADH is not stoichiometric with respect to initial ethanol concentration, and that with this procedure, the calibration curve for endpoint assay of ethanol is linear only for very dilute solutions. Likewise, the kinetic assay of ethanol using the kit procedure is limited to very dilute samples. A simple modification of the kit procedure is described which makes it amenable to the precise kinetic assay of up to 150 mg ethanol/liter in the reaction mixture. 20 refs.

25197 **Fleet experience using three blends of ethanol and unleaded gasoline.** Joseph, J.W.; Grogan, D.M. (DuPont, Aiken, SC). *SAE (Society of Automotive Engineers) Preprint ;* No. 801361, 4(Oct 1980).

The Savannah River Plant, which is operated by Du Pont for the Department of Energy, has successfully operated automotive and nonautomotive gasoline-powered equipment on three different blends of ethanol and unleaded gasoline. The conventional gasohol blend of 10% ethanol and 90% unleaded gasoline (10/90) has been used in addition to 15/85 and 20/80 blends. By October 1980, close to ten million miles will have been driven and almost one million gallons of gasohol consumed.

0903 Inorganic Hydrogen Compound Fuels

25198 **(NP—1903403) Energy conservation in the petroleum and chemistry industry: ammonia process. Final report, August 19, 1976-May 15, 1978.** Wilson, D.B. (New Mexico State Univ., Las Cruces (USA). Dept. of Chemical Engineering). Jun 1981. 85p. (EMD—2-65-1202). New Mexico Energy and Minerals Department, Santa Fe. Order Number DE81903403.

The National Energy Plan has mandated that US industry should reduce energy consumption a total of 25% (using 1972 as the base year) by the year 1985. This report examines a three phase methodology for achieving this goal; i.e., Phase One-operator training and general housekeeping; Phase Two-modification of current process operating conditions; Phase Three-evaluation of new raw materials and alternative processes. Emphasis is on Phase One and Two technology. A set of training modules is provided for either self-instruction or formal operator training. In addition, a table of selected terms and conversion factors is provided. Assessment of computer programs as generally available and applied for Phase Two methodology is examined. Consideration of an appropriate method for evaluating the energy efficiency of a process is reported and three examples for improving ammonia processing are described.

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 25277, 25285, 25437, 25825, 25827, 25829, 25830, 25831, 25835, 25846, 26054, 26057, 26058, 26059

25199 **(ANL/CNSV-TM—60) Proceedings of the international conference on prepared fuels and resource recovery technology.** Wallin, D. (ed.). (Argonne National Lab., IL (USA)). Apr 1981. Contract W-31-109-ENG-38. 527p. (CONF-810258—). NTIS, PC A23/MF A01. Order Number DE81024488.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

In response to the growing need for information on the use of prepared fuels for waste-to-energy projects, the US Department of Energy (DOE) and the US Environmental Protection Agency (EPA) sponsored a conference in Nashville, Tennessee, February 10-13, 1981. These proceedings document presentations at that conference. Recognized authorities in various areas of prepared fuels technology, as well as experts in the financing and marketing aspects of prepared fuels, discussed the front-end technology of preparing solid waste for resource recovery and the marketing requirements of the various energy applications for prepared fuels. One day of the three-day conference was devoted to presentations by manufacturers of prepared fuel systems who described their systems. One half-day session considered timely issues on waste flow control. Separate abstracts of individual items have been prepared for inclusion in the Energy Data Base. (DMC)

25200 (ANL/CNSV-TM—60, pp 3-15) **Prepared fuel systems: selecting an option.** Lewis, S.G. (MITRE Corp., Bedford, MA). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The question of selecting a resource recovery technology option is discussed. Approaches are discussed and experiences are given to illustrate why decisions were made to pursue prepared fuel systems. It is concluded that selecting an option involves full consideration of not only the technology, but company qualifications, costs, and the nature of the business deal.

25201 (ANL/CNSV-TM—60, pp 55-79) **Overview of prepared fuels technology.** Trezek, G.J. (Univ. of California, Berkeley); Savage, G.M.; Diaz, L.F. Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Municipal solid waste can be mechanically processed for the production of a solid fuel (RDF). Major unit processes involved in the production of RDF are discussed. These include size reduction, air classification, screening, and densification. Properties of prepared fuels are delineated and are followed by a discussion of modeling techniques. Modeling can be helpful in avoiding errors and predicting the performance of various system designs.

25202 (ANL/CNSV-TM—60, pp 135-153) **Waste fuel densification: review of the technology and applications.** Campbell, J.A. (National Center for Resource Recovery, Inc., Washington, DC). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The production of densified refuse-derived fuels (d-RDF) as a substitute for coal in industrial or institutional spreader-stoker boilers is a developing waste-to-energy alternative. The early production experience at several pilot plants and continuing operations at eight densification facilities in the US and abroad will be reviewed. Equipment requirements, performance and product proprties are summarized from the production of over 1300 Mg d-RDF. Experiences in storage and handling are also discussed. Projection of capital and operating costs for a densification module are provided. Over 25 combustion tests have been conducted utilizing various sizes and quantities of d-RDF in controlled blends with coal in several types of stoker-fed boilers. Observations and results on the boiler capacity, efficiency and emissions are briefly reviewed.

25203 (ANL/CNSV-TM—60, pp 209-241) **Americology Resource Recovery System.** Mallan, G.M. (American Can Co., Greenwich, CT). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The Americology resource recovery plant, located in Milwaukee, Wisconsin, is owned and operated by the American Can Company. Construction of the plant was conducted by the Bechtel Corp. and began in 1975, at an original capital cost of $18.7 MM. Plant operations commenced in April 1977 and 400,000 tons have been processed through August 1980. The plant was designed to produce shredded, air-classified refuse-derived fuel through a relatively simple, low cost process. The plant also is capable of reclaiming ferrous, aluminum, glass and bundled paper. The refuse-derived-fuel produced was to be sold for combustion with coal. Although the plant itself is a proven technological success, utilization of the refuse-derived-fuel has been substantially less than anticipated. Americology is currently considering several alternatives, including construction of a boiler designed to burn refuse-derived-fuel and produce steam for sale to industrial customers.

25204 (ANL/CNSV-TM—60, pp 413-431) **Technical and marketing issues affecting the use of RDF as kiln fuel.** Duckett, E.J. (Schwartz & Connolly, Inc., Washington, DC). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Refuse derived fuel (RDF) has been experimented with and proposed for use in kilns for the production of portland cement and other construction materials. Technical and marketing issues affecting the use of RDF in cement kilns are reviewed.

25205 **Energy recovery from municipal solid waste and sewage sludge using multisolid fluidized-bed combustion technology.** Ballantyne, W.E.; Huffman, W.J.; Curran, L.M.; Stewart, D.H. (Battelle Columbus Labs., OH). *ACS (American Chemical Society) Symposium Series ;* No. 130, 109-123(1980). (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

This study was initiated to investigate the potential for energy recovery from municipal solid waste and sewage sludge using Battelle's multi-solid fluidized bed combustion (MS-FBC) technology. The MS-FBC technology was chosen because it represents an advanced fluidized-bed combustion technology that is designed to operate with heterogeneous solids while achieving higher throughputs and larger turn-down ratios than conventional fluidization. The technology, originally developed for coal, was thought to be highly adaptable to the diverse solids that are inherently difficult to process when using municipal solid waste (MSW) and domestic sewage sludge (DSS). Steam generation from MSW and DSS has been studied by many investigators, but fouling of heat transfer surfaces can be a major problem. Thus, this research study also sought to investigate direct steam generation using hot sand to vaporize the water in DSS (4% solids) in a conventional fluidized bed that is an integral part of the MS-FBC technology. The research program incorporated several items and the two tasks discussed in this paper were: Task 1, obtain experimental data using a MS-FBC pilot plant to validate calculated energy recovery; Task 2, demonstrate the technical feasibility of direct steam generation using DSS as 4% solids.

25206 **Biomass densification energy requirements.** Reed, T.B. (Solar Energy Research Inst., Golden, CO); Trezek, G.; Diaz, L. *ACS (American Chemical Society) Symposium Series ;* No. 130, 169-177(1980). (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

Biomass materials, especially residues, are in many ways an attractive renewable fuel. However, they suffer from low volume energy content and occur in a wide variety of forms unsuitable for fuel use. Densification of biomass to pellets, briquettes, logs, or dense powders yields clean, renewable fuels with energy densities comparable to coal. Yet the cost and energy required for densification must be considered in deciding whether densification is practical in a given situation. A knowledge of the dependence of this energy on various operating parameters also will make possible design of better densification processes. The purpose of this study was to determine the work required for densification under various laboratory conditions and to compare this to the energy consumed by practical operating equipment.

13 HYDRO ENERGY

REFER ALSO TO CITATION(S) 25435, 25568, 25569, 25574, 25575

1301 Resources And Availability

REFER ALSO TO CITATION(S) 25211, 25391, 26421

25207 **(DOE/R9/10019—T1) Small hydroelectric potential at existing hydraulic structures in California. Appendixes: data and guidelines for development. Bulletin 211.** (California Dept. of Water Resources, Sacramento (USA)). Apr 1981. Contract FC49-80R910019. 497p. NTIS, PC A21/MF A01.

These appendices to the report on the evaluation of the small-scale hydroelectric power potential of existing dams, canals, and water pipelines in California contain data on: lists of potential small-scale projects; field investigations; feasibility studies; capacity and cost data; licensing; utility purchase prices for hydro power; financing; hydro equipment; and equipment manufacturers. (LCL)

25208 **(DOE/R9/10019—T2) Small hydroelectric potential at existing hydraulic structures in California. Bulletin 211.** (California Dept. of Water Resources, Sacramento (USA)). Apr 1981. Contract FC49-80R910019. 95p. NTIS, PC A05/MF A01.

The Department of Water Resources studied the feasibility and cost effectiveness of retrofitting existing hydraulic structures within California with facilities for generating hydroelectric power. A statewide survey identified 285 sites - 137 dams, 53 canals, and 95 pipelines - where hydropower could be developed. These sites offered a combined potential for generating 510 megawatts (MW) of power with an annual energy production of 2.4 billion kilowatthours (kWh). The 285 sites were categorized into six groups, based on the type and size of existing hydraulic structure. From these, 49 sites were selected for field investigations, and preliminary feasibility studies were conducted at 28 of these representative sites. Based on these studies, the cost effectiveness of each site was determined, and these cost data were used to estimate the cost effectiveness of the remaining sites for which limited data were available. The study showed that 167 (59%) of the 285 sites with an installed capacity of 468 MW are cost effective if developed immediately for initial operation in 1984. An additional 73 (26%) of the sites with an installed capacity of 36 MW would be cost effective by 1989. Out of the 285 potential projects 80 facilities - representing over 355 MW of the total installed capacity of 510 MW - have been completed, are under construction, or have had applications filed for them with FERC. The results of this study emphasize the value of utilizing all of our potential energy resources. Developing the small hydroelectric facilities identified here would make available over 2.4 billion kWh of electrical energy annually. Development of this resource would significantly reduce California's dependence on imported oil, provide a dependable, environmentally sound source of electrical energy, and would be an important contribution to the nation's goal for energy independence.

1303 Plant Design And Operation

REFER ALSO TO CITATION(S) 25571

25209 **(DOE/ID/01570—T21(Vol.1)) Small hydro plant development program. Volume 1. Text.** (Idaho National Engineering Lab., Idaho Falls (USA); Acres American, Inc., Columbia, MD). Oct 1980. Contract AC07-76ID01570. 273p. (IDO—1009(Vol.1)App.L). NTIS, PC A12/MF A01.

Investigations of the technical and economical feasibility of using pump (turbine)-induction motor (generator) packages in lieu of standardized turbogenerator units in small hydro development projects are documented. Turbine mode performance of pumps was simulated by a computer model and selected packages covering a

major part of the head-flow-power range were compared to equivalent standardized turbogenerator units. This volume contains information on: small hydro plant sizes and existing equipment; pump types and sizes; selection of generating equipment; performance evaluations of pump turbines and generators; and an economic evaluation of pump turbine-induction motor (generator) equipment. (LCL)

25210 **(EPRI-EM—1589(Vol.8)(App.C)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix C. Heavy hoist. Final report.** (Potomac Electric Power Co., Washington, DC (USA); Acres American, Inc., Buffalo, NY). Apr 1981. Contract AC02-77ET28013. 157p. NTIS, PC A08/MF A01. Order Number DE81025106.

This appendix documents an assessment of the permanent heavy hoist equipment suitable for an underground pumped hydroelectric (UPH) facility. Overriding considerations, including type of hoist, capacity limitations, operating speed, haulage ropes, guides, conveyance, and landings were studied within the context both of feasibility and of minimizing equipment costs. The study led to the selection of a twin drum, twin electric drive hoist, and for depths as much as 5000 ft, hoist capacities of up to 300 tons were found to be feasible. A brief reference is made to the requirements for hoisting equipment other than for heavy loads. Design development of the UPH facility, including the selected permanent heavy hoist equipment, is described in other volumes of the final report.

25211 **(DOE/ID/01570—T21(Vol.2)App.A-K) Small hydro plant development program.** (EG and G Idaho, Inc., Idaho Falls (USA); Acres American, Inc., Columbia, MD). Oct 1980. Contract AC07-76ID01570. 322p. (IDO—10094(Vol2)App.A-K). NTIS, PC A14/MF A01.

This volume of a report on the technical and economic feasibility of using pump turbine - induction motor (generators) packages in lieu of standardized turbogenerator units in small hydro development projects contains the following appendices: listing of Hydroelectric Power Resources by State; Manufacturers' Data on Standardized Hydroturbines; Inventory of Available Pumping Equipment; Characteristics of Representative Pumps; Survey of Pump Manufacturers and Engineering Firms; Model Pump-Mode and Turbine-Mode Characteristics; Prototype Turbine-Mode Characteristics; Pump (Turbine) - Motor (Generator) Equipment Packages; Manufacturers' Data on Components of Equipment Packages; Overspeed Calculations; and Economic Evaluation. (LCL)

25212 **(DOE/ID/01570—T21(Vol.3)App.L) Small hydro plant development program.** (EG and G Idaho, Inc., Idaho Falls (USA); Acres American, Inc., Columbia, MD). Oct 1980. Contract AC07-76ID01570. 95p. (IDO—10094(Vol.3)App.L). NTIS, PC A05/MF A01.

This volume of a report on the technical and economic feasibility of using pump turbine - induction motor (generator) packages in lieu of standardized turbogenerator units in small hydro development projects contains the user's manual for the pump/turbine computer simulation model, including the program listing and data file. (LCL)

1304 Regulations And Licensing

25213 **(EPRI-EM—1589(Vol.13)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 13. CAUPH preliminary licensing documentation. Final report.** (Potomac Electric Power Co., Washington, DC (USA); Acres American, Inc., Buffalo, NY). Apr 1981. Contract AC02-77ET28013. 187p. NTIS, PC A09/MF A01. Order Number DE81025110.

This volume documents the current regulatory requirements for licensing permits and approvals applicable to implementing either the Compressed Air Energy Storage (CAES) facility or the Underground Pumped Hydroelectric (UPH) facility at a specific site location in Montgomery County, Maryland. An implementation plan and schedule is also developed for the period from project authorization by the sponsor through receipt of all required regulatory authorizations. The documentation is based upon review of all pertinent regulations on the federal, state and local level of government, review of other publications, acquisition of applicable guides and forms, and discussions with responsible agency representatives. The implementation plan is specific to the requirements within the State of Maryland; the plan is based primarily upon the state's siting procedure which provides coordinated state agency approvals. Notwithstanding the site specific nature of the plan, many of the regulatory requirements, as well as the approach to implementation, should be suitable for general reference in developing licensng plans for CAES or UPH facilities.

1305 Economics And Management

REFER ALSO TO CITATION(S) 25209, 25211, 25598

25214 **(ORNL/TM—7694) Net energy of seven small-scale hydroelectric power plants.** Gilliland, M.W.; Klopatek, J.M.; Hildebrand, S.G. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 119p. NTIS, PC A06/MF A01. Order Number DE81025857.

The purpose of this study was to perform a net energy analysis of seven small-scale hydroelectric plants, all retrofitted to an existing dam, and to compare them to conventional hydroelectric plants and other energy supply technologies using the net energy criterion. The net energy results are expressed as the ratio of energy output to energy input. Two ratios were developed. In the first (R_1), the energy output, expressed as electricity, was divided by the energy subsidy; in the second (R_2), the energy output, expressed as the fossil fuel equivalent of electricity, was divided by the energy input. The results indicate that the energy output from the seven plants is 8.6 to 32.9 times greater than the energy input for the R_1 case, and 26.3 to 101.4 times greater than the energy input for the R_2 case. Five of the seven plants have ratios in the range of 10:1 to 12:1 (R_1) or 30:1 to 37:1 (R_2). Net energy ratios for existing conventional hydroelectric power plants operating on multipurpose dams are 11.2:1 for one base load plant and 2.6:1 and 7.2:1 for two peak load plants (R_1 in all cases). Thus, on the net energy criterion, the small-scale plants are better than conventional peak load hydroelectric plants and similar to conventional base load hydroelectric plants. Net energy ratios given in the literature for coal-fired power plants range from 4.3:1 to 7.2:1 and for nuclear plants from 3.8:1 to 4.1:1. Thus, these small-scale hydroelectric retrofits probably represent a better energy investment than conventional power plants.

25215 **Small-scale hydro in New England: 1960-1976.** Kirshen, P.H. (Va Polytech Inst and State Univ, Blacksburg). *Journal of the Energy Division (American Society of Civil Engineers)* ; **107**: No. 1, 31-39(May 1981).

A review of the capacity and licensing data on small-scale hydro (SSH) in New England in the period 1960 to 1976 is presented and compared to national and regional hydropower data. Costs of electricity data are also reviewed. Major findings are that until recently New England has followed the past national trend of decreased interest in both large-scale hydro (LSH) and SSH and of retiring small, inefficient plants. Generally, LSH has been used for peaking, SSH for run-of-the-river. Most of the present capacity in New England is privately owned; little is state or municipally owned. Since the interest in hydropower is inversely related to the costs of alternatives for producing electricity, it appears that the recent interest in SSH will continue (municipal and rural coop interest seems particularly strong). 10 refs.

1306 Environmental Aspects

REFER ALSO TO CITATION(S) 25576

14 SOLAR ENERGY

REFER ALSO TO CITATION(S) 25979

25216 (CONF-790203—) Interregional symposium on solar energy for development. (Japan Industrial Technology Association, Tokyo). 1979. 583p. NTIS (US Sales Only), PC A25/MF A01.

From Solar energy symposium; Tokyo, Japan (5 Feb 1979).

The Interregional Symposium on Solar Energy for Development was held at Tokyo, Japan, February 5-10, 1979. Forty-four papers have been entered individually into EDB. (LTN)

25217 (DOE/CS/10070—T1) Solar Audience Test summary report. Task Assignment No. 3. (Market Facts, Inc., Washington, DC (USA)). 3 Dec 1980. Contract AC01-80CS10070. 33p. NTIS, PC A03/MF A01.

The purpose of the Solar Audience Test is to support the preparation of effective national public-service advertisements for solar energy. The methodology for conducting the test is described. The features shown to consumers were Master of the Sun; Passive Solar; Solar Energy Fair. Responses of the consumers to the features are summarized.

25218 (DOE/MI/01002—T5) Identification of business opportunities for the minority-owned small businesses in the solar energy area. Final report, July 1980-January 1981. (Solar America, Inc., Albuquerque, NM). 1981. Contract AC01-80MI01002. 13p. NTIS, PC A02/MF A01. Order Number DE81025194.

The activities of the project are reviewed briefly; the directories which resulted are described; and recommendations for future activities are made. (MHR)

25219 (SAND—81-0764) Development of solar energy in Peru. Pierson, H.O.; Nahui, A. (Sandia National Labs., Albuquerque, NM (USA); ITINTEC, Lima (Peru). Div. de Energia). Jun 1981. Contract AC04-76DP00789. 24p. NTIS, PC A02/MF A01. Order Number DE81025014.

Peru receives a high degree of solar radiation, except for part of its coastal area, and has almost an ideal climate for the development of solar energy. However, only recently has a concerted effort been made in Peru to take advantage of these conditions. Work focuses on the development of low-temperature applications, including the design of passive solar-heated buildings for the high Andes, the design and evaluation of various types of solar water heaters and crop dryers for both household and industrial uses (based on flat-plate collectors), and the construction of a desalinization prototype plant. Photovoltaic systems are being investigated for suitable applications and have an excellent potential, especially in telecommunications.

25220 (SERI/TP—753-1205) Information and the solar consumer. Shoemaker, F. (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH00178. 8p. (CONF-810560—2). NTIS, PC A02/MF A01.

From AS/ISES special interest group on energy and environment information conference; Denver, CO, USA (11 May 1981).

A brief review of the use of solar energy in the US is presented and then the attitude of solar consumer are summarized. Results of research show that information or knowledge of an innovation proceeds at a faster rate than the actual adoption of that innovation. It is noted that until the level of solar knowledge increases to about 30% of the potential end users who have seriously considered the technology and plan to invest in it, adoption of the technology will be limited.

25221 Heat transfer and the future of solar energy utilization. Kreith, F. (Solar Energy Res Inst, Golden, Colo). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-41, vp(Nov 1980).

This paper presents a summary and evaluation of heat-transfer related research topics which are considered significant in advancing solar energy utilization. 14 refs.

25222 (DOE/MI/01002—T5(App.A)) Solar Program Directory: appendix A. (Solar America, Inc., Albuquerque, NM). [nd]. Contract AC01-80MI01002. 86p. NTIS, PC A05/MF A01. Order Number DE81025195.

The Solar Program Directory was developed primarily for use by the minority-owned small business community as an aid in identifying business opportunities in the solar program field. This directory briefly describes the activities of the Department of Energy in solar energy research, development, and demonstration. The Directory is divided into two sections: (1) Technology Applications Directory, and (2) General Category Directory.

25223 (DOE/MI/01002—T5(App.C)) Minority-owned small business directory: appendix C. (Solar America, Inc., Albuquerque, NM). [nd]. Contract AC01-80MI01002. 90p. NTIS, PC A05/MF A01. Order Number DE81024383.

This directory consists of minority-owned, small businesses located throughout the United States that have provided or have the capability of providing goods and/or services to the US Department of Energy's Solar Programs. Based upon the information received from the firms themselves, via a telephone survey, it is believed that these firms have the capabilities of providing research, development, and demonstration services to the Department of Energy's solar programs. In order to facilitate the use of the Directory it has been divided into the four following sections: (1) All minority-owned, small businesses are listed by State. The listing includes the name, address, and telephone number of the firm, an identification code which includes an asterisk that indicates the firm has been designated 8(a) by the SBA, and a brief description of the firm's capabilities and services it offers. (2) Minority-owned, small businesses are listed alphabetically, and indicating which technologies the firms have the capability to perform. (3) The minority-owned, small businesses are listed by region. (4) This Section consists of state abbreviations, a list of states by region, and a source list from which the firms were selected.

1401 Resources And Availability

25224 (ATR—80(7747)-1(Vol.1)) Measurements of typical insolation variation at Daggett, California. Volume I. Methodology and sample data. Randall, C.M.; Johnson, B.R.; Whitson, M.E. Jr. (Aerospace Corp., El Segundo, CA (USA)). 1 Mar 1980. Contract AC03-78ET20517. 67p. NTIS, PC A04/MF A01. Order Number DE81024305.

Observations of insolation variation for a site representative of the Ten-Megawatt Solar Thermal Pilot Plant (approximately 600 meters in size) were made at 16-second intervals for the period from August 1978 through October 1979 at a location near Barstow, California. The analysis of data from this experiment is reported. Insolation variations over the experiment site indicate partly cloudy conditions existed approximately 25 percent of the time for the one-year experimental period. During these partly cloudy periods, shadows with dimensions less than the pilot plant heliostat field size were observed. Rates of insolation change greater than 30 $W/m^{-2}\,sec^{-1}$ were also observed; however, these observations were limited by the sampling rate of the experiment. A procedure was developed to interpolate to any point within the experiment array by means of insolation variation maps. Detailed data packages are supplied for eight days that were determined to be typical of the different partly cloudy conditions observed during the year. These measurements indicate that variations are much more severe than were originally assumed in the derivation of the Ten-Megawatt Solar Thermal Pilot Plant operating requirements.

25225 (ATR—80(7747)-1(Vol.2)) Measurements of typical insolation variation at Daggett, California. Volume II. Appendices including data sets. Randall, C.M.; Johnson, B.R.; Whitson, M.E. Jr. (Aerospace Corp., El Segundo, CA (USA)). 1 Mar 1980. Contract AC03-78ET20517. 131p. NTIS, PC A07/MF A01. Order Number DE81024047.

Observations of insolation variation for a site representative of the 10-MW solar thermal pilot plant were made at 16-second intervals for the period from August 1978 through October 1979 at a location near Barstow, California. Detailed data packages are supplied for eight days that were determined to be typical of the dif-

ferent partly cloudy conditions observed during the year. Also included in appendices are the experiment calibration, the format of insolation variation scenario tape, and a list of Fortran subroutine TRANSM to compute interpolated transmittance map values. (MHR)

25226 Solar-meteorological research program for the South-Central US. Rudzki, J.E.; Clark, G.; Loxsom, F.; Micek, L. *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-24, vp(Nov 1980).

In 1977, the U.S. Department of Energy began a solar-meteorological research and training program. Eight universities were selected, one each in six regions of the contiguous United States, and one each in Alaska and Hawaii. Trinity University, in cooperation with Baylor University, the University of Houston, and the University of Texas at Arlington, serves the region composed of Arkansas, Kansas, Louisiana, Oklahoma, Missouri, and Texas. This paper describes the plans, objectives, and preliminary results of this regional program. 11 refs.

25227 On-site quality control of insolation measurements. Wolff, W.J.; Clark, G.; Rudzki, J.E. *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-25, vp(Nov 1980).

The instrumentation used to collect minute averages of more than thirty solar-meteorological parameters at the U.S. Department of Energy-Trinity University observation station is described. The objective of the station is to compile a data base in which the total errors in the minute averages are less than two percent. In addition to careful maintenance and calibration, the objective of highly accurate data required the development of a variety of on-site quality control procedures. This paper describes the hardware and software quality control procedures which have been implemented. 1 ref.

25228 Diffuse sky measurements and determination of corrected shadow band multiplication factors. Mujahid, A.; Turner, W.D. (Univ of Ark, Fayetteville). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-26, vp(Nov 1980).

A meteorological monitoring station has been in operation at Blytheville, Arkansas, from April 1978 to April 1980. Direct normal, global, and diffuse sky radiation have been monitored. From these data, models have been developed for the prediction of solar radiation, and discussions of several diffuse solar radiation models are included herein. Comparisons are made with these current diffuse models, and the correlation is quite good. In addition, instantaneous shadow band correction factors are presented which will allow a more accurate correction to be applied to the measured diffuse sky reading. 15 refs.

1403 Economics

REFER ALSO TO CITATION(S) 25644

1404 Environmental, Legal, And Institutional Aspects

REFER ALSO TO CITATION(S) 25303, 25849

25229 (ANL/EES-TM—140) Technology assessment of solar energy systems: air-quality effects of direct-solar and biomass systems in high- and low-deployment scenarios. Habegger, L.; Dauzvardis, P.; Snider, M.; Michel, P.; Gasper, W. (Argonne National Lab., IL (USA)). Jan 1981. Contract W-31-109-ENG-38. 85p. NTIS, PC A05/MF A01.

The potential benefits and damages to air quality that are related to utilization of solar and biomass technologies as alternatives to more conventional energy-producing technologies are evaluated. A compilation of emission levels from various biomass technologies is included. Secondly, it evaluates and compares national and regional cumulative emissions for two solar and biomass growth scenarios in the year 2000: a low-growth scenario of 6 Quad and a high-growth scenario of 14.2 Quad. For the high-growth solar scenario, both the national sulfur-dioxide and nitrogen-oxide emissions were projected to be approximately 5% lower than for the low-growth scenario. In contrast, particulate emissions were estimated to be approximately 10% larger for the high-growth scenario, primarily due to emissions from direct combustion of forest and agricultural residues in small, poorly controlled units. Both scenarios project an increase from 1975 national levels of sulfur-dioxide and nitrogen-dioxide emissions, and both project a decrease from 1975 national levels of particulate emissions. Air-pollutant implications of the solar and biomass scenarios for the ten federal regions are also discussed. This indicates significant regional differences in technology mix and the relation of emission changes to attainment and maintenance of air-quality standards within the regions.

25230 (DOE/TIC—1025039) Overcoming land-use barriers to solar access: solar planning recommendations for local communities. (Central Naugatuck Valley Regional Planning Agency, Waterbury, CT (USA)). Feb 1980. 145p. NTIS, PC A07/MF A01.

The existing legal and institutional barriers to the installation of solar energy systems and to the protection of solar access caused by land use regulations and policies in the Central Naugatuck Valley Region are analyzed. Specific barriers in zoning, subdivision, inland wetland, historic district, building code, and public health code regulations which could impede the development of solar domestic hot water systems and passive solar design concepts are identified. Specific recommendations are provided for overcoming land use barriers to solar access and for promoting energy conscious building, landscaping and site planning design in Connecticut.

25231 (SERI/TR—744-876) Solar energy legal bibliography: second update. Weiner, S. (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH00178. 114p. NTIS, PC A06/MF A01. Order Number DE81025911.

The Solar Energy Legal Bibliograhy Update is a compilation of approximately 100 solar publications abstracted for their legal and policy content (covering the period February 1980 to July 1980). Emphasis is on legal barriers and incentives to solar energy development. Abstracts are arranged under the following categories: Antitrust, Biomass, Building Codes, Consumer Protection, Environmental Aspects, Federal Leglislation and Programs, Financing/Insurance, Institutional Issues, International Law, Labor, Land Use (Covenants, Easements, Nuisance, Zoning), Local Legislation and Programs, Ocean Energy, Passive Solar Heating and Cooling, Patents and Licenses, Photovoltaics, Small-Scale Hydro, Solar Access Rights, Solar Heating and Cooling, Solar Thermal Power Systems, Standards, State Legislation and Programs, Tax Law, Tort Liability, Utilities, Warranties, Wind Resources, and General Solar Law.

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 25180, 25183, 25185, 25186, 25190, 25191, 25192, 25193, 25194, 25195, 25205, 25206, 25229, 25381, 25406, 25409, 25644, 25646, 25648, 25893, 25905, 25954, 26231, 26437

25232 (CONF-8006156—) Basic research needs and opportunities on interfaces in solar materials. Czanderna, A.W.; Gottschall, R.J. (eds.). (Department of Energy, Washington, DC (USA)). Apr 1981. 250p. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

The workshop on research needs and recommended research programs on interfaces in solar energy conversion devices was held June 30-July 3, 1980. The papers deal mainly with solid-solid, solid-liquid, and solid-gas interfaces, sometimes involving multilayer solid-solid interfaces. They deal mainly with instrumental techniques of studying these interfaces so they can be optimized, so they can be fabricated with quality control and so changes with time can be forecast. The latter is required because a long lifetime (20 yrs is suggested) is necessary for economic reasons. Fifteen papers have been entered individually into EDB and ERA. (LTN)

25233 (CONF-8006156—, pp 1-8) Executive summary. Gottschall, R.J. (Dept. of Energy, Washington, DC); Czanderna, A.W. Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

Problems resulting from diffusion in the solid/solid interfacial region are expected because most SECS require multilayer, large-area, thin-film, polycrystalline components. The preparation of such multilayer devices leads to a device morphology that uniquely depends on the technique and process parameters by which the device is fabricated. In general, however, such thin film structures will contain high densities of imperfections such as dislocations, grain boundaries, and dissimilar material film interfaces which act both as sources and high mobility paths for diffusing species even at low temperatues. Diffusion between and along these imperfections is sensitive to the device fabrication procedure and the resultant defect state. These multilayered thin-film structures must withstand exposure to fields (electromagnetic, thermal, electrical, and photon) and thermal stresses which may enhance defect mobility over thirty year service lifetimes. Defect mobility will in turn influence or control degradative processes which occur at interfaces in devices and their performance and efficiency per se by its effect on optical absorptivity, electron-hole recombination, and minority carrier lifetime in photovoltaics, and on optical absorptivity, infrared emittance, and thermal conductivity in photothermal systems.

25234 (CONF-8006156—, pp 9-24) **Overview of solar energy conversion technologies: quantum processes and thermal processes.** Call, P.J. (Solar Energy Research Inst., Golden, CO). Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

The conversion of solar energy into heat, fuels, or electricity is accomplished by a wide range of technologies. The sunlight may first interact with the biosphere producing winds, ocean currents, thermal gradients, salinity gradients, moving water or plants to be harnessed by turbines, low temperature heat engines, or biomass processing systems. Alternatively, systems that interact directly with incoming sunlight may provide more cost effective sources of energy in many climates. The purpose of this chapter is to provide an overview of these conversion systems and their critical interfacial problems focussing primarily on direct quantum and thermal systems. Direct quantum conversion includes the production of fuels from photobiological, photochemical, and photoelectrochemical converters, and the generation of electricity from photovoltaic systems. Key interfacial questions in these systems are related to the efficiency of charge separation and the repression of charge recombination. The thermal conversion of sunlight to useful heat, ranging from low temperature hot water heating to process heat in excess of 1000°C, requires the successful absorption and conversion of photons to phonons with minimum reradiation. For temperatures in excess of 100°C, satisfactory conversion efficiencies require optical concentrators. The concentrators dominate the interfacial problems in these systems. The interaction of the working fluid (used to extract the heat from the receiver and to deliver it to the end use) with the container material of the receiver heat transfer system is also of considerable interest. Brief discussions of ocean thermal, biomass, and membrane systems are also included.

25235 (CONF-8006156—, pp 25-34) **Design requirements for interfaces in solar energy conversion technologies.** Butler, B.L. (Solar Energy Research Inst., Golden, CO). Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

The interface needs of solar energy systems are described according to their role in either optical subsystems or receiver/converter subsystems. Many of the functions performed by these subsystems require large areas of interfaces which must be produced by low cost processes, and result in stable chemical, physical, and optical interfaces. The large areas required, e.g., 2000 m^2 for 1 MW of solar thermal power or approximately 28,000 square miles for the annual US needs of 85 quads, are in marked contrast with the small areas used in the microelectronics industry. Examples of interfaces in solar reflectors, absorbers, and photovoltaic cells are used to illustrate the constraints placed on solar interfaces. The combined requirements posed by the solar radiation, terrestrial weather, and system operating conditions place unique demands on the materials and their interfaces. Basic and applied interface problems must be addressed and solved as solar technologies are developed and deployed. Solar energy systems are both large area and materials intensive. This makes their initial costs high relative to coal, oil, and gas systems. The life cycle cost of solar systems can be reduced nominally by improving component performance and dramatically by increasing useful component life. Thus, minimum capital cost materials and processes wich result in components and interfaces with 30 years expected lives may be required for economic viability. The 30 year lifetime may be necessary, because operation and maintenance costs for large collector arrays are expected to be high, increasing significantly the system payback period.

25236 (CONF-8006156—, pp 35-54) **Interfacial phenomena in solar materials.** Murr, L.E. (New Mexico Inst. of Mining and Technology, Socorro). Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

This chapter provides a short review of the fundamental features of general classes of interfaces and interfacial thermodynamics. The energetics and structures of interfaces are reviewed in the context of applications of current understanding of interfacial phenomena to specific materials in several solar technologies. Overviews are presented for interfacial energetics, compositional and chemical analysis of interfaces, and the structure of interfaces and representative illustrations are provided. Numerous examples of interfacial phenomena pertinent to solar materials interface problems are included, and solar materials interface problems are discussed and summarized in a general way. Problems or concerns are tabulated for interfaces in specific solar systems or components, e.g., reflectors, polymers, absorbers, collectors, PV cells, storage systems, and heat transfer materials.

25237 (CONF-8006156—, pp 55-68) **Overview of the solid/solid interface: mechanical stability.** Hoffman, R.W. (Case Western Reserve Univ., Cleveland, OH). Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

Photothermal and photovoltaic device structures require large area thin film multilayers that must be uniformly processed and will withstand a hostile service environment for long periods without degradation. Present experience with demanding thin film applications resides in microcircuits and optical applications. Thus little background for predictive capability exists in the case of high, cyclic temperature excursions, oxidation/corrosion ambients, and abrasive winds to be expected for reflectors and collectors. Long term mechanical stability will be governed by control of the stresses produced during growth followed by stabilization of the microstructure. At fast deposition rates, grain boundaries may become even wider and possess large quantities of impurities. Many dielectric films contain microscopic voids which give rise to reversible and irreversible behavior. The mechanical strains produced in a film during growth are a result of the microstructure as well as thermal expansion. Some control is possible, but is often limited as a result of the (gaseous) impurities which may not be stable at high temperatures. Mechanical integrity requires the solution to many of these problems. Recent developments in high strength films, prevention of grain growth by modulating the structure, and producing a specific microstructure for a desired optical property show that progrss is possible. Opportunities for surface science will be to comprehend atomic mobilities in the formation and stabilization of real microstructures in solar environments, to produce new materials, and to develop new techniques, especially in situ and non-distructive, to give early detection and predictive capability of failure.

25238 (CONF-8006156—, pp 69-96) **Overview of current status of solid/liquid interface science.** Bockris, J.O'M. (Texas A and M Univ., College Station). Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

An overview of the current status of solid/liquid interface science is presented, along with some comments about its relevance to solar energy conversion technologies. A discussion of the diffuse layer includes past and current perspectives of the structure of H_2O

in the double layer and its role on potential changes at the metal/liquid interface. The difficulties of considering the potential changes of semiconductor or insulator/liquid interfaces are related to surface states and dangling bonds. The methods available for investigating the solid/liquid interface are reviewed, i.e., sweep, ellipsometric, radiotracer, AES, XPS, and Mossbauer methods. Frumkin's contributions and the potential at zero charge (p.z.c.) are also discussed. The difficulties and prospects of measuring and/or calculating absolute potentials of solid/liquid interfaces from understanding the p.z.c. are then considered. Organic and ionic adsorption isotherms and the factors limiting their contribution to increasing the understanding of the solid/liquid interface are reviewed. Future prospects and needs for research on the solid/liquid interface are outlined. Developments in this field are in an early stage, compared with the solid/gas interface, but the subject material has a more practical bearing to real systems. New theoretical approaches, including modeling of the double layer and diffuse layer using quantum mechanical and Monte Carlo approaches are clearly needed. A need for elucidating the structure at semiconductor/liquid interfaces and its bearing on photoelectrochemical solar energy conversion is indicated. The need for applying in situ spectroscopic and direct measurements to study the solid/liquid interface is clearly required for extending present understanding.

25239 (CONF-8006156—, pp 97-104) **Overview of current status of solid-gas interface science.** Hansen, R.S. (Iowa State Univ., Ames). Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

The principal methods for establishing chemical composition, long range structure, short range structure, and nature of chemical bonding at the solid gas interface are reviewed. Electron and ion spectroscopies largely developed over the past two decades have vastly improved the ability to establish interface chemical composition, and developments over the past five years have done much to put determination of long range and short range structures on firm ground. The high vacuum requirements of these techniques limit their applications to interfaces whose stability under evacuation can be reasonably presumed. This is a serious limitation for many solar applications, and new methods of characterization not subject to it are badly needed. Some possibilities are indicated.

25240 (CONF-8006156—, pp 105-113) **Limitation of experimental capabilities for interfacial studies.** Lichtman, D. (Univ. of Wisconsin, Milwaukee). Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

Solar energy technologies involve components and devices whose operation depend critically on various interfaces. To obtain optimum performance from these devices it is essential to be able to analyze in some detail the characteristics of these interfaces. In principle, there now exist enough experimental techniques to determine essentially everything that one might want to know about the surface of a solid or the solid-solid interface. In practice, that stage has clearly not yet arrived. The reason is not for lack of experimental techniques or theoretical approaches but primarily due to the limitations of these approaches. The most popular tool for determining the elemental composition at S/G and S/S interfaces is AES in which the electrons resulting from radiationless deexcitation of atoms are energy analyzed. Almost all peaks in an Auger spectrum can be unambiguously identified. However, one must be concerned with various limitations. Another useful approach is to use an ion beam as a probe for surface elemental composition, leading to the techniques of SIMS and ISS. The major limitation of ion probes is the destruction of the substrate, either for the analysis (SIMS) or because of ion bombardment (ISS). One is also interested in the chemical nature of the various elements. For some materials, AES can answer some of these questions, but not in every case. In principle, XPS also called ESCA can answer these questions, but in practice the valence state may not be identifiable. The morphology of the surface is of interest. Here, the SEM is clearly the popular technique being used. In all of the approaches mentioned, the power density effects of the beam probes must always be taken into account and can often be a severe limiting factor. Specific details about limitations of the popular techniques as well as observations about other techniques, are considered.

25241 (CONF-8006156—, pp 115-133) **Limitations of ion etching for interface analysis.** Holloway, P.H.; Bhattacharya, R.S. (Univ. of Florida, Gainesville). Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

The advantages and limitations of using ion sputtering for interfacial analysis are reviewed. It is concluded that many artifacts may degrade interfacial resolution (e.g., surface roughness, zone of mixing, bulk and surface diffusion, implantation, residual gas adsorption, and matrix effects). Techniques to minimize these limitations are suggested. Some examples are using reactive ion beams, multiple ion beams, sample rotation and special mounting, variable ion energies and incident angles, and deconvolution methods. It is concluded, however, that sputtering may destroy atomic arrangement and chemical state information at the interface. New approaches are needed to determine these interfacial parameters.

25242 (CONF-8006156—, pp 135-149) **Basic research needs and opportunities at the solid/solid interface: diffusion.** Balluffi, R.W. (Massachusetts Inst. of Tech., Cambridge); Duke, C.B.; Kazmerski, L.L.; Mitchell, K.W.; Reifenberger, R.; Wood, R.F. Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

An attempt is made to identify the basic research needs and opportunities which exist with respect to solid/solid interfaces and diffusion in materials and devices relevant to solar energy. Firstly, the generic problems characteristic of solar energy materials are considered. Secondly, the specific problems involving solid/solid interfaces and diffusion which are peculiar to solar energy materials are described and discussed. Thirdly, the research needs and opportunities associated with these phenomena are identified. General areas of research considered to be either crucial, important or useful include the following: (1) development of microstructure; (2) microstructural stability; (3) dependence of diffusion and nucleation of new structures on external influences (especially thermal cycling, electric fields, radiation fields); (4) acquisition of standard reference data (solid/solid interface diffusion and electrical data); and (5) relationship between microstructure (and its time-dependence) and electrical, optical and mechanical properties of composite materials. Finally, priorities are assigned to a number of research areas falling within the above categories.

25243 (CONF-8006156—, pp 151-166) **Basic research needs and opportunities at the solid-liquid interface.** Bockris, J.O'M (Texas A and M Univ., College Station); Cafasso, F.A.; Davison, S.G.; Furtak, T.E.; Heldt, L.A.; Knotek, M.L.; Truhan, J.J.; Weeks, J.R.; Wittenberg, L.J. Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

A panel was convened to deliberate on basic research needs and opportunities at solid-liquid interfaces important in solar energy materials science. The committee concluded that needs exist in two areas, photoelectrochemistry and solar energy-related degradation phenomena. Research is recommended to (1) develop special real-time in situ analytical techniques in order to probe any study solid-liquid interfaces, (2) formulate a theory that incorporates the properties of the solid-liquid interface, (3) generate new materials for photoelectrochemical conversion systems, (4) study photo-assisted synthesis and electrocatalysis, and (5) investigate the mechanisms of electrochemical degradation (especially photocorrosion), mechanical degradation (especially corrosion fatigue), and erosion in solar energy systems. These recommendations, together with their background and justification, are discussed.

25244 (CONF-8006156—, pp 167-182) **Basic research needs and opportunities at the solid/gas interface.** Brodsky, M.B. (Argonne National Lab., IL); Cathcart, J.V.; Hansen, R.S.; Kliewer, K.L.; Landman, U.; Park, R.L.; Shatynski, S.R. Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

Solid-gas reactions that may occur at surfaces of devices exposed to the normal solar environment (i.e., ambient air, high uv flux, thermal cycling, etc.) are of major concern in solar technol-

ogy. Surfaces of importance include glass and polymer transmitters and polymer coatings generally, all of which may develop microcracks or otherwise fail in solar systems at rates far in excess of those for uniform degradation. An equally important, although less obvious, class of solid-gas interfaces are those developed sequentially in the manufacture of multilayer devices, e.g., mirrors and photovoltaic converters. Thus, it becomes necessary to know how the properties of a particular component layer are affected by the manufacturing environment (air, vacuum, etc.) and especially to know how the overall operation of the device is influenced by the cumulative effect of these various surface reactions. There are a number of important chemical reactions which involve photoconversion and/or photocatalysis. In these processes, solid/gas interfaces occur on the catalysts and their support materials. Major research needs include a detailed understanding of semiconductor surfaces, with and without chemisorbed species; and understanding of the photoconversion and photocatalysis mechanisms; effects of sensitizers; understanding of spill-over phenomena; theoretical calculations; and new experimental methods for analysis of the S/G interface under ambient pressure. In both thermal conversion and catalytic conversion systems, the transfer of energy occurring at solid-gas interfaces is very important. The problem is not simple, especially under high uv fluxes and on non-metallic systems. It is conceivable that useful resonant energy transfers may be predictable.

25245 (CONF-8006156—, pp 183-197) **Basic research needs and opportunities at the solid/solid interface: adhesion, abrasion, and polymer coatings.** Butler, B.L. (Solar Energy Research Inst., Golden, CO); Butler, G.B.; DeLollis, N.J.; Fowkes, F.M.; Hartman, J.S.; Hoffman, R.W.; Inal, O.T.; Miller, W.G.; Schissel, P.; Tompkins, H.G. Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

Thirty year service lifetimes are desired for photothermal and photovoltaic devices for use in an environment of moisture, pollutants, abrasive particulates, thermal cycling, and ultraviolet radiation. These devices contain a plethora of solid/solid interfaces of dissimilar materials which are especially vulnerable to degradation induced by this environment. Polymer coatings offer promise for protecting the optical properties and retarding interfacial degradation behavior of solar collectors and glazings. The nature of the bonds that cause adhesion between dissimilar materials such as polymers and semiconductors or polymers and metals, etc., requires identification and a fundamental mechanistic understanding. Present interfacial science is limited by macroscopic experiments which do not permit either a spatial extrapolation to atomic mechanisms, or a time extrapolation from laboratory real times to 30 year service periods. Mechanistic understanding is required for polymer behavior including surface hardening, stability in an environment of moisture and various airborne contaminants, and degradation under prolonged integrated exposure to ultraviolet. The understanding should result in long time behavioral modeling from short time laboratory data, and the ultimate molecular design of optimal coatings and interfaces in photothermal, photovoltaic, reflector, and concentrator devices.

25246 (CONF-8006156—, pp 199-214) **Basic research needs and opportunities in thin films and coatings.** Arthur, J.R. (Perkin-Elmer, Eden Prairie, NM); Bunshah, R.F.; Call, P.J. Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

Objectives are proposed for necessary thin-film solar-related research, namely: (1) to gain a better understanding of basic process involved in thin film fabrication; (2) to determine process parameters and the relationship of process parameters to thin film properties; and (3) to develop better methods for characterizing the product film or coating in terms of relevant materials properties and product degradation modes. Discussion is divided into three areas corresponding to these objectives. The need for in situ characterization during the film or coating process, which can be fed back to control deposition parameters and thus maximize product quality and uniformity, is emphasized. In a Summary of Research Needs and Priorities, specific topics of research are presented that were determined by consensus to be of greatest priority to solar thin film devices. In an appendix Examples of Solar Applications and Needs Related to Coatings and Thin Film Research, the basic researcher is provided background information about some specific solar thin film problem areas.

25247 (CONF-8006156—, pp 215-237) **Basic research needs and opportunities for characterizing the microstructure and microchemistry of interfaces.** Holloway, P.H. (Univ. of Florida, Gainesville); Lawless, K.R.; Lichtman, D.; Meisenheimer, R.G.; Murr, L.E.; Powell, C.J.; Silcox, J. Apr 1981. NTIS, PC A11/MF A01.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

Interfaces of many types (S/S, S/G, S/L) occur in the materials configuration of most solar devices, often with several in close proximity. To make solar devices economically competitive, the manufacturers must make them reliable and reproducible and in cost effective batch quantities. Economic viability also requires that design performance be sustained over long periods of time (e.g., 30 years). To extrapolate from short term laboratory behavior to the required 30 year service behavior requires an atomic level mechanistic understanding of the degradation processes occurring at interfaces. The latter in turn requires application of forefront techniques and methods of characterization of localized microstructure and microchemistry. Needs were identified for microcharacterization on spatial scales ranging from the macroscopic to the microscopic given structural, chemical or electronic configurations. Comparison of available techniques with these needs revealed major inadequacies. Much greater effort needs to be invested in in-situ techniques. Efforts to extend the capabilities of surface analytical techniques to meet the identified needs are necessary. Recent developments in analytical electron microscopy show promise of complementing the surface technologies and should be developed. Wide use of these techniques in concert is encouraged and wider use of electron microscopy in general is necessary. Much deeper understanding of existing techniques is necessary and totally novel characterization approaches should be encouraged, particularly for in-situ characterization of S/L, S/G interfaces.

25248 **(DOE/ER/04380—T1) Organic photochemical storage of solar energy. Progress report, February 1, 1980-January 31, 1981.** Jones, G. II. (Boston Univ., MA (USA). Dept. of Chemistry). 2 Mar 1980. Contract AS02-77ER04380. 16p. (COO—4380-4). NTIS, PC A02/MF A01. Order Number DE81023131.

The valence isomerization of organic compounds has been studied with emphasis on mechanisms involving photoionization of electron donor-acceptor pairs. Norbornadienes have been shown to undergo rearrangement as the result of quenching fluorescent sensitizers. A mechanism involving the formation of radical-ion pairs in polar solvent and triplet states of either sensitizer or quencher is supported by flash photolysis results and the observation of chemically induced dynamic nuclear polarization. Valence photoisomerization of charge-transfer complexes of quadricyclenes and hexamethyl(Dewar benzene) has been studied, including the finding of a novel wavelength dependence of quantum yield of photoionization. In a model study projections have been made, using a computerized analysis of kinetic parameters, of the dependence on temperature of quantum efficiencies for photoreactions involving electron or energy transfer. Preliminary results are reported concerning a new investigation of the photodecomposition of water using organic redox reagents. Electron donor-acceptor pairs (dicarbonyl compounds and amines or CT complexes of methyl viologen) have been photolyzed in aqueous solution with the evolution of hydrogen in the presence of a platinum catalyst.

25249 **(DOE/ET/23108—7) Photovoltaic mechanisms in polycrystalline thin-film silicon solar cells. Quarterly report No. 6, November 1, 1980-January 31, 1981.** Redfield, D. (RCA Labs., Princeton, NJ (USA)). Feb 1981. Contract AC01-79ET23108. 24p. NTIS, PC A02/MF A01. Order Number DE81023076.

New results have been obtained in both active areas of this program: establishing guidelines for optimization of the design of silicon solar cells and developing a new model for the electronic properties of grain boundaries. In the first area, an extensive series of measurements has shown the beneficial effect of a grown layer

of SiO_2 as thin as 100 A, a result that is recommended for general use. In the second area, new analyses and experiments are confirming the model for grain boundaries described in the last quarterly report. Both the absence of potential barriers before annealing and their development at 900°C are shown to be consistent with the new model and difficult to explain on other bases.

25250 **(DOE/JPL/954331—81/14) Silicon materials task of the low-cost solar-array project. Phase IV. Effects of impurities and processing on silicon solar cells. Twenty-second quarterly report, January 1981-March 1981.** Hopkins, R.H.; Hanes, M.H.; Davis, J.R.; Rohatgi, A.; Rai-Choudhury, P.; Mollenkopf, H.C. (Westinghouse Research and Development Center, Pittsburgh, PA (USA); Hemlock Semiconductor Corp., MI (USA)). 29 Apr 1981. Contract NAS-7-100-954331. 82p. NTIS, PC A05/MF A01. Order Number DE81023936.

The overall objective of this program is to define the effects of impurities, various thermochemical processes, and any impurity-process interactions upon the performance of terrestrial solar cells. It was confirmed - at least for V, Mo, and Cr - that impurity-induced ingot structure breakdown occurs at a lower liquid-impurity concentration for polycrystalline ingots than when growing single crystal ingots. The threshold impurity concentration for breakdown, C/sub l/*, is 2 to 10 times smaller for poly ingot growth. Using a model which relates the measured value of C/sub l/* to crystal growth rate, crystal diameter, and impressed thermal gradient, the value of the liquid diffusion constant, D, has been calculated for several metal impurities studied. Deep level spectroscopy measurements were employed to identify the mechanism of solar cell performance reduction observed during accelerated (high-temperature) aging tests. For Ag and Cr-doped solar cells, respectively, cell efficiency loss correlates with a reduction in bulk minority-carrier lifetime and the formation of deep levels which did not appear in the devices prior to aging at elevated temperature.

25251 **(DOE/JPL/955825—81/1) Evaluation and verification of epitaxial process sequence for silicon solar-cell production. Quarterly report No. 1.** Redfield, D. (RCA Labs., Princeton, NJ (USA)). Apr 1981. Contract NAS-7-100-955825. 21p. NTIS, PC A02/MF A01. Order Number DE81023405.

Recent progress, present status, and new data are presented by tasks defined in the contract. These tasks are: development of silicon substrate materials, process sequence determination, process specifications, minimodule design, process and design verification, and cost evaluations and projections. An overview of the schedule planned for these tasks and the current status of the schedule are presented in a chart. (LEW)

25252 **(DOE/JPL/955909—81/2) Low-cost solar-array project production process and equipment task: a module experimental-process system-development unit (MEPSDU). Quarterly report No. 2, March 1, 1981-May 31, 1981.** (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). 1981. Contract NAS-7-100-955909. 46p. NTIS, PC A03/MF A01.

Module design work resulted in several major modifications. The frame was deleted in favor of a frameless design which will provide a substantially improved cell packing factor. Also, a modification in the cell series/parallel electrical interconnect configuration will eliminate potential shaded cell damage resulting from operation into a short circuit. The baseline process sequence defined for the Westinghouse MEPSDU was refined. Equipment design and specification work was completed, albeit at a slower rate than originally planned due to reduced spending directions. SAMICS costs analysis work was accelerated. Format A's were prepared, and computer simulations completed on the terminal. Design work on the automated cell interconnect station proceeded as scheduled and was focused on bond technique selection experiments.

25253 **(DOE/NOAA/OTEC—38) OTEC Pilot Plant: requirements to design fabrication inspection, maintenance and repair of Hull, CWP and SKSS.** Fjeld, S.; Stokke, K.; Foss, G.; Malmo, J. (Norske Veritas, Oslo (Norway). Industrial and Offshore Div.). 13 Feb 1981. Contract AI01-79CS20396. 140p. NTIS, PC A07/MF A01. Order Number DE81024914.

The applicability of national and proprietary regulations and codes for the design and construction of the OTEC pilot plant is investigated. Main characteristics to consider in this study are the unique water depths, dimensions and purpose of the OTEC plant. On the basis of this study minimum technical specifications for the OTEC hull, CWP and SKSS have been suggested.

25254 **(PB—81-113177) Land biomass program. Annual report 1 Apr-31 Dec 79.** Jain, K. (General Electric Co., Philadelphia, PA (USA)). Sep 1980. Contract GRI-5011-323-0159. 88p. NTIS, PC A05/MF A01.

This report describes the results of the 1979 efforts on the Land Biomass program. The program is a long range research and development effort and the results described are preliminary. The overall objective of the program is to develop integrated processes including production, harvesting, and conversion, to produce methane from land-based crops that are cost-competitive on a commercial basis with alternative sources of energy. A program plan based largely on short rotation farming of herbaceous and woody biomass is described. Significant land related issues such as suitability and availability of land, and system parameters such as biomass productivity, methane yield, feedstock cost, unit product cost, and overall system efficiency are reviewed. Sixteen candidate species of woody and herbaceous biomass were selected based on certain selection criteria discussed in the report. Samples of these species were collected for composition analysis and to obtain experimental data on methane yields. Both the anaerobic digestion and thermal gasification techniques are being evaluated for the production of methane from biomass samples.

25255 **(PB—81-113185) Marine biomass program. Annual report 1 Jan-31 Dec 79.** Tompkins, A.N. (General Electric Co., Philadelphia, PA (USA)). 17 Oct 1980. Contract GRI-5010-323-0014. 115p. NTIS, PC A06/MF A01.

The Marine Biomass Program is a Research and Development Program which has as its overall objective the development of integrated processes for production and harvesting of seaweed in the ocean and conversion of that seaweed to methane at costs competitive, on a commercial scale, with other alternate energy production systems. The General Electric Company has been the prime contractor in the conduct of this RandD Program for the Gas Research Institute since December 1976. The United States Department of Energy has also sponsored research on this program by funding to the California Institute of Technology, and has provided additional support to the program through a cooperative grant made to General Electric in 1978. Experimental data has shown that controlled cultivation of macroalgae is feasible, and that fuels can be derived from marine biomass feedstocks. Extensive work with Macrocystis has indicated that it can be grown in the open ocean when fertilized by artificially upwelled deep ocean waters. Kelp thus derived has been shown to be favorably suited to methane production by the process of anaerobic conversion. This report expands upon this data base with emphasis on the technical and economic requirements of the critical parameters associated with biomass yield and overall energy balance.

25256 **(SAND—81-1164C) Solar photovoltaic system engineering perspectives.** Jones, G.J. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 7p. (CONF-810808—7). NTIS, PC A02/MF A01. Order Number DE81023179.

From Energy in the man-built environment: the next decade specialty conference; Vail, CO, USA (3 Aug 1981).

Current photovoltaic system costs are approximately ten times higher than prices which would be competitive with conventional energy sources. Approximately half of the necessary cost reduction must come from innovative engineering and the reduction of design cost. The present system design status and the needed areas of innovation are discussed. Those activities of the National

Photovoltaic Program which are aiding this process by providing background information are presented and major issues are highlighted.

25257 (SERI/PR—8104-3-T3) Low cost, sprayed CdTe solar cell research. Semiannual progress report, August 15-February 14, 1981. Squillante, M.R.; Turcotte, R.; Talbot, M.; Serreze, H.B.; Lis, S.; Entine, G. (Radiation Monitoring Devices, Inc., Watertown, MA (USA)). Mar 1981. Contract AC02-77CH00178. 30p. NTIS, PC A03/MF A01.

This program is examining techniques to deposit CdTe solar cells by spray pyrolysis utilizing methods superior to those previously developed to produce device quality CdS and CdSe thin films. Spray pyrolysis is a very attractive process due to its inherent simplicity and low cost and we have extended the existing technology by making use of inorganic tellurium salt and by appropriately modifying the process parameters. During the past six months, progress has been made using heterojunction CdS/CdTe cells. A process has been developed for spray depositing a doped, low resistivity Cds (or ZnCdS) window layer which combines elements from both the standard thiourea spray technique and our improved technique and which requires no post-deposition annealing treatment. Copper doped CdTe is then deposited onto the thin CdS layer. For small ITO/CdS/CdTe/Aquadag devices ($\sim$ 4mm^2) we have obtained V_o/sub c/ of up to 0.64 volts, J/sub sc/ to 14 mA/cm^2, fill factors up to 0.54 and AMl efficiencies up to 4%. Large area devices ($\geq$ 1 cm^2) have also been successfully prepared. Such devices have had V_o/sub c/ of 0.6 volts, J/sub sc/ of 11 mA/cm^2, fill factors of 0.5, and conversion efficiencies above 3%. Similar results have been obtained using arsenic doped, sprayed CdTe films. We are currently investigating structures which utilized evaporated contacts (such as Au or Cu) in additon to the Aquadag contacts, and preliminary results appear very encouraging.

25258 (SERI/PR—8142-4-T2) Preparation and characterization of hydrogenated amorphous silicon. Quarterly progress report No. 7, 1 December-28 February 1981. Donovan, T.M. (Solar Energy Research Inst., Golden, CO (USA); Naval Weapons Center, China Lake, CA (USA). Michelson Labs.). 1981. Contract AC02-77CH00178. 15p. NTIS, PC A02/MF A01.

The results of a study of the effect of ion-bombardment on interface contamination of amorphous silicon, as measured by SIMS and ^{19}F analysis, and the mode of hydrogen incorporation, as measured by IR vibrational spectroscopy, are presented. (MHR)

25259 (SERI/PR—8279-1-T2) Low-cost-silicon-process development. Phase IV: process improvement. Second quarterly technical progress report. Giraudi, R.V.; Newman, C.G. (Schumacher (J.C.) Co., Oceanside, CA (USA)). Apr 1981. Contract AC02-77CH00178. 62p. NTIS, PC A03/MF A01.

A number of promising techniques for improving the overall yield and economics of the tribromosilane based process to produce solar cell grade silicon is investigated. The current work is aimed at the identification of an optimum process and the characterization of that process through mini-plant operation and analysis. The three project tasks include process improvement studies, kinetic studies, and process economic studies. During this second quarter reporting period process improvement studies continued in the mini-plant, focusing on the correlation of current mini-plant yield results with prior laboratory scale work. Silicon bromination in the synthesis unit and tribromosilane purification in the distillation unit proceeded efficiently and without complication during this reporting period. Tribromosilane yields in the synthesis unit were low due to unobtainable higher reaction temperatures. Initial polycrystalline silicon production studies have indicated consistent yields of 85%. The laboratory scale static bulb reactor system was calibrated by observing the decomposition of t-butyl chloride. These results compared very well to results obtained by previous investigators for the same decomposition. Upon the conclusion of the calibration tests, the tribromosilane decomposition rate study was initiated. Two decompositions were completed and it was concluded that the reaction order can not be determined at this time. A free space reactor apparatus was assembled and tribromosilane decompositions, as a function of dilution in argon, was studied.

25260 (SERI/PR—9131-1-T3) Controlled cadmium telluride thin films for solar-cell applications. Third quarterly report, December 1, 1980-February 1, 1981. Das, M.B.; Krishnaswamy, S.V. (Pennsylvania State Univ., University Park (USA). Materials Research Lab.). 15 May 1981. Contract AC02-77CH00178. 14p. NTIS, PC A02/MF A01. Order Number DE81023275.

From chemical compositional analysis, it is surmised that in indium doped CdTe films cadmium vacancies do occur causing possibly deep level acceptor states to be present in the material. By sputtering at a cadmium overpressure, it was possible to compensate for these vacancies and thus improve the device quality significantly. Extensive temperature dependent measurements of dark and illuminated I/V characteristics of gold metallized Schottky barrier diodes based on these improved and reproducible films have been made. Barrier height of 723 MeV and the thermionic emission coefficient of 19 A/cm^2 $^0K^2$ have been calculated. Characteristics showing I/sub sc/ and V/sub oc/ at different temperatures and different illumination level are presented.

25261 (SERI/PR—9175-1-T3) Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981. Ang, P.G.P.; Tiller, A.J.; Rossignuolo, A.A.; Sammells, A.F. (Solar Energy Research Inst., Golden, CO (USA); Institute of Gas Technology, Chicago, IL (USA)). Apr 1981. Contract AC02-77CH00178. 24p. NTIS, PC A02/MF A01.

The photoelectrochemical properties of p-Si, p-InP, p-MoS_2, and n-CdSe semiconductors are presented. A number of redox storage systems are discussed. Characteristics of single-crystal systems and of surface treatments are investigated. Long-term testing was performed with polycrystalline CdSe and with p-InP single crystal in electrochemical cells. The quality and long-term stability of various electrodes, electrolytes, and separator materials were studied. (LEW)

25262 (SERI/PR—9272-1-T1) Novel concepts in electrochemical solar cells. Quarterly technical progress report, December 15, 1980-March 15, 1981. (Solar Energy Research Inst., Golden, CO (USA); Research Inst. of Colorado, Fort Collins (USA)). 1981. Contract AC02-77CH00178. 66p. NTIS, PC A04/MF A01.

During the past quarter, the following areas were emphasized: (a) characterization of redox couples with very positive potentials in room-temperature $AlCl_3$-BPC electrolytes and comparison of the electrochemical behavior of decamethyl ferrocene in these electrolytes with the previously-studied ferrocene/ferricenium ion couple, (b) photoelectrochemical characterization of CdSe thin-film anodes in aqueous polysulfide electrolytes and (c) refinement of the admittance measurement technique for extraction of Mott-Schottky parameters. The results of research in these areas are detailed in turn below.

25263 (SERI/TR—8274-1-T1) Low-cost epitaxial techniques for solar-cell fabrication. Final report, 25 September 1979-24 September 1980. D'Aiello, R.V.; Robinson, P.H. (Solar Energy Research Inst., Golden, CO (USA); RCA Labs., Princeton, NJ (USA)). Nov 1980. Contract AC02-77CH00178. 65p. NTIS, PC A04/MF A01.

This research and development effort was designed to investigate epitaxial growth processes which will allow the use of low-cost forms of silicon for fabricating high-efficiency, cost-effective solar cells. This report covers the results of a 1-y effort which involved characterization of potentially low-cost silicon substrates, epitaxial growth studies, and the fabrication and evaluation of solar cells made in the epitaxial layers. Silicon substrates prepared from metallurgical grade silicon by potentially low-cost purification and growth techniques form satisfactory substrates for epitaxial growth and the fabrication of 10 to 12% efficient solar cells. The allowable range of variation in the key parameters of the epitaxial process and cell structures was determined and it was found that a greater variation in these parameters is possible for solar cells compared with those required for epitaxial devices now produced in the semiconductor industry. Thin-film epitaxially grown solar cells were reproducibly demonstrated with efficiencies of over 10%. A scale-up to practical sized cells was shown to be feasible by fabricating cells of 10-cm^2 area with almost 10% efficiency.

25264 (SERI/TR—9053-1-T3) Diagnostics of a glow discharge used to produce hydrogenated amorphous silicon films. Final report, February 15, 1980-April 14, 1981. Gallagher, A.; Scott, J. (Colorado Univ., Boulder (USA)). 1981. Contract AC02-77CH00178. 20p. NTIS, PC A02/MF A01.

The glow-discharge deposition apparatus, with mass spectrometer sampling, was constructed and tested with Ar and SiH_4 gas. It successfully achieved the desired high vacuum ($\sim 10^{-8}$ Torr), gas flow rates (200 sccm), and mass spectrometer sensitivities ($\sim$ 1 ppM). Ion and neutral species were measured from the end and side of a dc discharge in SiH_4, finding major changes with sampling position, gas pressure, and discharge power. These observations were explained qualitatively with a discharge model, based on known electrical characteristics of dc discharges combined with available information and some assumptions regarding silane reaction rates. The ion species from a dc-proximity discharge, and from the end and sides of an rf discharge in SiH_4 were studied. Qualitative comparisons have been made to the dc discharge results and to approximate models for the fields and charge distributions in rf discharges. Impurity concentrations were studied in the vacuum system and silane gases, with sensitivities of $\leq$ 1 ppM outside of mass regions overlain by SiH_4 ion spectra. The impurity levels attained in the apparatus appear to be entirely due to impurities in the SiH_4 gas, and are typically at the 1 to 100 ppM level.

25265 Graded-index Pt-Al_2O_3 composite solar absorbers. Craighead, H.G.; Howard, R.E.; Sweeney, J.E.; Buhrman, R.A. (Bell Telephone Laboratories, Holmdel, New Jersey 07733). EG-77-S-03-1456. *Applied Physics Letters ;* **39**: No. 1, 29-31(1 Jul 1981).

The solar absorption properties of thin composite films of coevaporated Pt and Al_2O_3, formed with a graded composition-depth profile, are compared to those of an identical film overcoated with a microscopically textured layer of SiO/sub x/. The composition grade of the metal-dielectric composite and the surface texturing of the SiO/sub x/ produces a film with a refractive index slowly varying to unity at the front surface. This results in a very low reflectance of the film. The solar absorptivity of this graded refractive index surface is shown to be a high as 0.98. The production and structure of these surfaces are described as well as a general method of absorptivity enhancement using a microscopically textured surface formed by reactive ion etching.

25266 Solar induced water splitting with p/n heterotype photochemical diodes: n-Fe_2O_3/p-GaP. Mettee, H.; Otvos, J.W.; Calvin, M. (Lawrence Berkeley Lab., CA). Contract W-7405-ENG-48. *Solar Energy Materials ;* **4**: No. 4, 443-453(Apr 1981).

A p/n photochemical diode consisting of p-GaP and n-Fe_2O_3 has been assembled in a monolithic unit which, when exposed to visible and near uv radiation in aqueous solution, produces hydrogen in relatively low quantum yields. This unit also splits seawater using incident solar radiation. Both photoelectrode materials showed enhancements of their photo currents when catalysts (RuO_2 on n-Fe_2O_3 and Pt on p-GaP) were deposited on their surfaces. The gases generated at each electrode were mass spectrometrically confirmed as originating from the water.

25267 Review of conductor-insulator-semiconductor (CIS) solar cells. Singh, R. (Energy Conversion Devices, Inc., Troy, MI); Green, M.A.; Rajkanan, K. *Solar Cells ;* **3**: No. 2, 95-148(Mar 1981).

The physics and technology of a new class of photovoltaic devices, namely the conductor-insulator-semiconductor (CIS) solar cells, are reviewed. The top layer in these diodes may be a transparent conducting metal film, an oxide or polymer semiconductor, an electrolyte or a combination of these, leading to a wide variety of metal-insulator-semiconductor (MIS), semiconductor-insulator-semiconductor (SIS) and electrolyte-insulator-semiconductor (EIS) structures. The thickness of the interfacial layer and the work function of the conductor are the important parameters in the optimization of these devices. By ensuring inversion at the interface of the base semiconductor, devices can be fabricated with properties which do not depend strongly on the surface states nor on other non-idealities of the interfacial layer. CIS solar cells with efficiencies comparable with the best p-n junction cells have been fabricated. Most of the presentation is related to single-crystal devices, and the non-crystalline (polycrystalline and amorphous) semiconductor devices are treated separately. Available stability and accelerated life test data indicate fairly stable operation of optimized devices. It is suggested that the research and development efforts have reached such a stage that a prototype production facility is viable. 314 references.

25268 Efficient and stable photoelectrochemical cells constructed with WSe_2 and $MoSe_2$ photoanodes. Kline, G.; Kam, K.; Canfield, D.; Parkinson, B.A. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Solar Energy Materials ;* **4**: No. 3, 301-308(Mar 1981).

Single crystals of n-WSe_2 and n-$MoSe_2$ were grown and employed as the photoanode in a regenerative photoelectrochemical cell with an iodide/triiodide electrolyte. Solar to electrical power conversion efficiencies of 10.2 and 9.4% were achieved on selected crystals of WSe_2 and $MoSe_2$, respectively. Products of a photocorrosion reaction from a $MoSe_2$ electrode could not be detected in the electrolyte after one month of continuous operation. The photocurrent spectra and optimization of the electrolyte are also discussed.

25269 Loss mechanism analysis in single-crystal and polycrystalline silicon MIS solar cells to produce 13% efficiency. Rajkanan, K.; Anderson, W.A.; Rajeswaran, G. (State Univ. of New York, Buffalo). Contract AC03-79ET23044. *Solar Cells ;* **3**: No. 1, 17-25(Feb 1981).

Current mechanism studies have revealed band-to-band tunneling and surface state currents to control chromium MIS solar cell behavior. This information, together with intrinsic and design-related loss analysis, was used to optimize the design of the chromium MIS solar cell. It is shown that a high efficiency can be produced when the interface and grain boundary state densities are below 10^{12} cm^{-2} eV^{-1}, the interface oxide thickness is 12 to 18 A, the grain size is above 40 μm and the doping density is 10^{16} to 10^{17} cm^{-3}. This computer-aided design was used to fabricate a 13.2% experimental solar cell in agreement with the predicted performance.

25270 Method for evaluation of antireflection coatings. Redfield, D. (RCA Labs., Princeton, NJ). Contract AC-01-79ET-23108. *Solar Cells ;* **3**: No. 1, 27-33(Feb 1981).

A new method is described to provide quantitative evaluation of the overall effectiveness of antireflection coatings on optical detectors and solar cells in terms of a single parameter. This parameter [R] is the weighted average reflectance of the device, with the weighting factor being the product of the incident light flux density and the internal quantum efficiency of the device. Knowledge of [R] also permits the evaluation of the internal electrical properties of the device, independent of the surface reflectance. A simple procedure is given for the measurement of [R] to a good degree of accuracy. The simplicity and accuracy of the method were confirmed by experiments and calculations.

25271 Effects of intragrain defects on the local photoresponse of polycrystalline silicon solar cells. Inoue, N.; Wilmsen, C.W.; Jones, K.A. (Colorado State Univ., Fort Collins). Contract XS-9-8232-1. *Solar Cells ;* **3**: No. 1, 35-43(Feb 1981).

Intragrain defects in Wacker cast and Monsanto zone-refined polycrystalline silicon materials were investigated using the electron-beam-induced current (EBIC) technique. The EBIC response maps were compared with etch pit, local diffusion length and local photoresponse measurements. It was determined that the Wacker polycrystalline silicon has a much lower density of defects than does the Monsanto polycrystalline silicon and that most of the defects in the Wacker material are not active recombination sites. A correlation was found between the recombination site density, as determined by EBIC, and the local diffusion length. It is shown that a large density of intragrain recombination sites greatly reduces the minority carrier diffusion length and thus can significantly reduce the photoresponse of solar cells.

25272 Heterojunction solar cells on cuprous oxide. Papadimitriou, L. (Univ. of Thessaloniki, Greece); Economou, N.A.; Trivich, D. Contract ER-78-S-02-4995;AC04-79-ET23010. *Solar Cells ;* **3**: No. 1, 73-80(Feb 1981).

Heterojunction solar cells were made on Cu_2O by sputtering In_2O_3, SnO_2, CdO and mixtures of CdO and SnO_2 and by thermal evaporation of ZnSe. Photovoltaic effects were observed in most cases. High series resistances were an indication of chemical reactions at the interface. Auger surface analysis showed evidence of copper metal at the interface, arising from chemical reactions. For a CdO/Cu_2O junction formed at room temperature, no copper metal was found at the interface. The CdO/Cu_2O cells showed V/sub oc/ = 0.4 V and I/sub sc/ = .2 mA cm^{-2}. The properties appear to be dominated by a multiple-step tunneling at the junction, presumably due to dislocations and impurities in the Cu_2O samples as prepared.

25273 Controlling influence of the Cu/sub 2/S optical absorption coefficient on the short-circuit currents of cu/sub 2/S/CdS solar cells. Rothwarf, A.; Windawi, H. (Univ of Del, Newark). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Electron Devices ;* **ED-28**: No. 1, 64-69(Jan 1981).

Cu/sub 2/S is a p-type defect semiconductor and is the main optical absorber-current generator in the Cu/sub 2/S/CdS solar cell. This cell undergoes large reversible changes in its short-circuit current depending upon the ambient to which it is exposed. While a large number of mechanisms have been proposed for this effect, it can be accounted for solely on the basis of changes in the absorption coefficient of the Cu/sub 2/S, as controlled by the position of the Fermi level in the degenerate material. The relation between the absorption coefficient and sheet resistance for degenerate Cu/sub 2/S is compared to existing experimental data on material prepared in the same way as solar cells. 3 refs.

25274 Properties of polycrystalline silicon solar cells with controlled titanium additions. Rohatgi, A.; Hopkins, R.H.; Davis, J.R. Jr. (Westinghouse Electr Corp, Pittsburgh, Pa). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Electron Devices ;* **ED-28**: No. 1, 103-108(Jan 1981).

By coupling the results of electrical measurements, such as spectral response, lighted and dark I-V determinations, and deep-level-transient spectroscopy with optical and laser scan photomicroscopy, one can evaluate the effects of grain boundaries and impurities on silicon solar cells. Titanium which produces two deep levels, E/sub v/+0.30 and E/sub c/-0.26 eV, in silicon, degrades cell performance by reducing bulk lifetime and thus cell short-circuit current. Electrically active grain boundaries induce carrier recombination in the bulk as well as in the depletion region of the solar cell. Experimental data imply a small but measurable segregation of titanium into some grain boundaries of the polycrystalline silicon containing high Ti concentration (2*10/sup 14/ cm/sup -3/). 18 refs.

25275 Agricultural energy. Volume 2. Biomass energy crop production. St. Joseph, MI; American Society of Agricultural Engineers (1981). 321p. (CONF-8009144—(Vol.2)). $27.50.

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Fifty-three papers and seventeen abstracts are included. Separate abstracts were prepared for the papers. The abstracts were listed by title. (MHR)

25276 Economic and energy analysis of potential corn-residue harvesting systems. Claar, P.W. II; Colvin, T.S.; Marley, S.J. (Iowa State Univ., Ames). Contract EM-78-S-02-4916. *ASAE Publication ;* No. 4-81, 273-279(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

An economic and energy analysis for corn residue utilization on a 180-ha (450-acre) central Iowa farm is presented. The quantity of residue needed to dry the grain produced on the farm and to generate the steam required for a farm-sized alcohol distillery unit to produce liquid fuels for crop production and residue collection is discussed. An economic analysis of various systems that may be used to harvest and deliver the residue to the furnace site is presented. Results of an experiment to measure the quantities of corn residue produced on a central Iowa farm are given. These residue quantities were measured on a field where conservation ridge-tillage practices have been used for the past 10 years. Residue harvest at three rates was compared.

25277 Development of a concentric-vortex agricultural-residue furnace. Claar, P.W. II; Buchele, W.F.; Marley, S.J. (Iowa State Univ., Ames). *ASAE Publication ;* No. 4-81, 349-356(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

The ongoing development of an agricultural residue furnace is discussed as a means for reducing the farmer's need for petroleum products. The primary application for this direct-fired furnace is for drying high-moisture grain and/or forage. This furnace also may be used for additional farmstead applications, such as heating hot water for the farmstead buildings and green houses and generating steam for an ethanol distillery. Also, the furnace has been provided with two different fuel-feed systems for handling a wide variety of agricultural residue forms. The following topics are discussed: (1) combustion fundamentals of agricultural crop residue; (2) the design and development of a concentric vortex, cell furnace for burning highly volatile crop residues; and (3) the operation of the furnace.

25278 Quantitative method for photovoltaic encapsulation system optimization. Garcia, A. III (Spectrolab, Inc., Sylmar, CA); Minning, C.P.; Cuddihy, E.F. pp 108-118 of Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space. Azusa, CA; Society for the Advancement of Material and Process Engineering (1981).

From SAMPE symposium/exhibition; Los Angeles, CA, USA (28 Apr 1981).

A set of analytical methods are described which have been developed to enable quantitative analysis of encapsulation system designs for terrestrial photovoltaic modules. Design factors determined most important include: encapsulant thickness and modulus, emissivity of module surface, ribs on substrate modulus, and antireflective coatings.

25279 Molybdenum-tin as a solar cell metallization system. Boyd, D.W.; Radics, C. (Jet Propulsion Lab., Pasadena, CA). pp 119-124 of Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space. Azusa, CA; Society for the Advancement of Material and Process Engineering (1981).

From SAMPE symposium/exhibition; Los Angeles, CA, USA (28 Apr 1981).

The objective of the new method of metallization for silicon solar cells is to produce a low-cost, mechanically strong and stress-free ohmic contact. The contact, silk screened by using an ink consisting predominately of molybdenum tri-oxide and tin, is subjected to a preheat period in a neutral atmosphere up to the melting point of MoO_3, and a final heat period in a reducing atmosphere of forming gas. The advantages of this method are that the contact is purely metallic (free of frit), employs common metals, has a relatively closely matched coefficient of thermal expansion with silicon, is easy to solder with low-melting alloys and can be applied by an automated silk-screen process and fired at temperatures compatible with standard inks.

25280 Biomass as a nonfossil fuel source. Klass, D.L. (ed.). Washington, DC; American Chemical Society (1981). 576p. (CONF-790415—P8).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

In the 1970s, a major effort was launched in the United States to develop modern technology for the utilization of biomass energy. The symposium on biomass as a nonfossil fuel source, presented in Honolulu, Hawaii in April 1979 by the Division of Petroleum Chemistry at the American Chemical Society/Chemical Soci-

ety of Japan Joint Chemical Congress, was devoted to this subject. Twelve basic and applied research papers were presented at this symposium on biomass energy. This book contains updated versions of ten of these papers and fifteen additional papers to balance the treatment of the subject. These are grouped into the categories of biomass production, liquid fuels, gaseous fuels, economics and energetics, and systems analysis. Separate abstracts have been prepared of each item for inclusion in the Energy Data Base. (DMC)

25281 **Forest biomass for energy: a perspective.** Sajdak, R.L.; Lai, Y.Z.; Mroz, G.D.; Jurgensen, M.F. (Michigan Technological Univ., Houghton). *ACS (American Chemical Society) Symposium Series ;* No. 144, 21-48(1981). (CONF-790415—P8).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Various studies suggest wood could supply to to 10% of the Nation's current energy needs within the next decade. Depending upon the strategies used, eventually it may be possible to supply 20% of our total energy budget. However, the use of wood for energy production must be kept in proper perspective. Wood is not the only product of our forests. These lands play a vital role in providing various social and cultural benefits such as wilderness, outdoor recreation, wildlife, fish, and clean water. Therefore, no single resource or forest use can be examined in isolation from the others. Energy uses will have to be balanced against the growing demand on our forests for lumber, fiber products, and recreational opportunities. This paper analyzes the feasibility and implications of increased utilization of our forests as a source of energy. Consideration will also be given to the production of biomass from intensively cultured plantations as well as the quality of the biomass produced by different management techniques.

25282 **Production of nonwoody land plants as a renewable energy source.** Alexander, A.G. (Univ. of Puerto Rico, Rio Piedras). *ACS (American Chemical Society) Symposium Series ;* No. 144, 49-76(1981). (CONF-790415—P8).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The nature of herbaceous land plants and their potential usefulness as a future energy resource is presented in broad outline. The large number of herbaceous species found in both cool and warm climates and in both the wild and cultivated state suggests that at least a small percentage of these could become valuable sources of fuel. Extensive screening will be needed in a range of ecosystems to bring the number of candidate species to a manageable level. Both botanical and agronomic features to be evaluated during the screening process are briefly discussed. Some of the production and harvest operations required of herbaceous plants as agricultural commodities are also reviewed, together with partial costs analyses for the production operations. Management of the energy crop is seen to be the decisive cost input. This factor will be optimized in privately-owned operations motivated by a strong profit incentive.

25283 **Biomass production by freshwater and marine macrophytes.** North, W.J.; Gerard, V.A.; Kuwabara, J.S. (California Inst. of Tech., Pasadena). Contract E(04-3)-1275. *ACS (American Chemical Society) Symposium Series ;* No. 144, 77-98(1981). (CONF-790415—P8).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Research on aquatic macrophytes as producers of biomass has been undertaken at Woods Hole Oceanographic Institution (WHOI) on the east coast and on the west coast by a group of collaborators in a joint effort known as the Marine Biomass Project. Studies at WHOI have focused on estuarine and coastal situations with some attention recently to freshwater plants. The Marine Farm Project has primarily been concerned with oceanic biomass production. A group at WHOI has undertaken a wide variety of studies concerning aquatic macrophytes including nutrient uptake, growth, yields, and environmental factors affecting yields. Aquatic biomass production systems have been surveyed on a worldwide basis and currently the role of carbon as a potential limiting nutrient in biomass culturing is being examined. The Marine Farm Project is presently attempting to grow giant kelp in offshore waters off southern California. Other work related to aquatic biomass production includes an investigation at the University of California, Berkeley, of microalgae in ponds. This paper will emphasize discussion of the kelp production phases of the Marine Farm Project. Activities by the WHOI are briefly summarized.

25284 **Effects of reaction conditions on the aqueous thermochemical conversion of biomass to oil.** Molton, P.M.; Miller, R.K.; Russell, J.A.; Donovan, J.M. (Battelle Pacific Northwest Labs., Richland, WA). *ACS (American Chemical Society) Symposium Series ;* No. 144, 137-162(1981). (CONF-790415—P8).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The direct thermochemical conversion of woody biomass to oil is one method of producing liquid fuel. This method is currently being examined in a pilot plant at Albany, Oregon. At Albany, wood is liquefied at a temperature of 290 to 370°C, a pressure of over 3000 psig, and a residence time of 20 to 90 min in the presence of a 60:40 mixture of carbon monoxide:hydrogen, and a catalyst consisting of 5% sodium carbonate. In our work on the fundamental chemistry of this liquefaction technique, laboratory studies using pure cellulose as a model compound showed that liquefaction occurs rapidly at 300°C and below at a pressure of 2800 psig of steam with no added gas, in less than 1 hr. Furthermore, the effect of the sodium carbonate catalyst on the early liquefaction reactions is independent of its concentration to a level of below 0.8%. Gas chromatographic and mass spectrometric examination of the product oil shows its composition to be almost constant over the whole range of reaction conditions used. A re-examination of reactor design of future biomass liquefaction plants appears warranted in light of these results.

25285 **Energy plantation and the photosynthesis energy factory.** Fraser, M.D.; Henry, J.F.; Borghi, L.C.; Barbera, N.J. (InterTechnology/Solar Corp., Warrenton, VA). *ACS (American Chemical Society) Symposium Series ;* No. 144, 495-544(1981). (CONF-790415—P8).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

A Photosynthesis Energy Factory (PEF) is an integrated bioconversion system consisting of a dry-land Energy Plantation, a wood-fired power plant, and a wetlands biological wastewater treatment system, such as an algae pond. Products of a PEF are electricity from the power plant (produced via combustion of woody biomass), synthetic natural gas from digestion of the wetlands biomass, and reclaimed wastewater. Effluents and by-products from one system part can be beneficially used by other parts, leading to increased energy conversion and resource recovery at lower costs. In the initial study, a general technoeconomic model was used to investigate possible interactions between the various subsystems. In a second project, the PEF model has been expanded and generalized by analyzing possible model improvements in the areas of materials transportation, water and nutrients balances, other types of wetlands biological systems, and improvements in wood-fired combustion systems. Direct application of municipal wastewater to a dry-land Energy Plantation has been analyzed, also.

25286 **CdS/Cu_2S solar cell: basic operation and anomalous effects.** Rothwarf, A. (Univ. of Delaware, Newark). *Solar Cells ;* **2**: No. 2, 115-140(Oct 1980).

A consistent account of the basic operation of the CdS/Cu_2S solar cell as a heterojunction dominated by interface recombination is presented. The model is in good agreement with the results seen in high efficiency cells and from it the increased open-circuit voltage seen in (CdZn)S/Cu_2S cells can be predicted. The sensitivity of the cell's properties to heat treatments in reducing or oxidizing ambients results from changes in the carrier density in the extremely thin Cu_2S layer which are produced by the formation or reduction of a few monolayers of copper oxide on the surface of the Cu_2S. Anomalous effects in the spectral properties of the cell, enhancement of the short-circuit current by short wavelength light and quenching by long wavelength light, the cross-over of the light and dark current-voltage curves and the photocapacitance behavior stem from the trapping of carriers in deep levels in the compensated region of the CdS layer near the junction. The pronounced dip in spectral response at the CdS band gap wavelength for cells with

very thin Cu_2S layers results from the combined effects of a direct contribution to the current from holes generated in the CdS and of the current generated in the Cu_2S by light reflected from the opaque back contact of the cell. The behavior of the dark capacitance of the cell as a function of voltage and heat treatment is a consequence of the high density of levels in the upper half of the CdS band gap. 61 references.

25287 Airborne particulate soiling of terrestrial photovoltaic modules and cover materials. Hoffman, A.R.; Maag, C.R. (JPL, Pasadena, Calif). *Proceedings - Institute of Environmental Sciences ;* 229-236(May 1980). (CONF-800517—).

From 26. annual technical meeting of the Institute for Environmental Sciences; Philadelphia, PA, USA (11 May 1980).

One of the most significant causes of electrical performance degradation of flat plate photovoltaic modules exposed at outdoor sites has been the accumulation of airborne particulates on sensitive optical surfaces. To characterize and understand the "dirt" problem and to minimize its impact on array life cycle costs, a photovoltaic soiling study is being performed. This paper contains results obtained in the first phase of the study. 12 refs.

25288 /beta/-glucosidase production by aspergillus phoenicis in stirred-tank fermentors. Allen, A.; Sternberg, D. (US Army Natick Res and Dev Command, Mass). *Biotechnology and Bioengineering Symposium ;* No. 10, 189-197(1980). (CONF-791072—).

From 2. symposium on biotechnology in energy production and conservation; Gatlinburg, TN, USA (3 Oct 1979).

The enzyme /beta/-glucosidase plays an important 63 role in the saccharification of cellulose by the hydrolysis of cellobiose, an inhibitor of the cellulase enzymes. A study is made of optimizing / beta/-glucosidase levels by supplementation from a 63 separate fermentation. The grow of Aspergillus phoenicis in a culture, contamination by bacteria, and the assaying of /beta/-glucosidase are described. The mycelial /beta/-glucosidase will hydrolyze cellobiose at a rate comparable to the free enzyme. 23 refs.

25289 Agri-energy roundtable. Washington, DC; Agri-Energy Roundtable, Inc. (1980). 64p. (CONF-800265—(Exc.)).

From Agri-energy roundtable conference; New Orleans, LA, USA (7 Feb 1980).

Selected papers and materials from the Agri-Energy Roundtable Conference are published in this report. There are 14 articles containing information on: government perspectives; new technologies in agricultural development; new financing sources for agricultural development; commercial future for food technologies; and rural adaptation to agri-energy development and rapid change. Separate abstracts have been prepared of 3 individual papers for inclusion in the Energy Data Base. (DMC)

25290 Thermochemical conversion of biomass to fuels and feedstocks: an overview of R & D activities funded by the Department of Energy. Schiefelbein, G.F. (Pacific Northwest Lab., Richland, WA); Sealock, L.J. Jr.; Ergun, S. *ACS (American Chemical Society) Symposium Series ;* No. 130, 13-26(1980). (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

This paper is intended to provide an overview of thermochemical conversion technology development activities within the Biomass Energy Systems Branch of the US Department of Energy (DOE). The Biomass Energy Systems Branch (BESB) is a part of DOE's Division of Distributed Solar Technology. The biomass thermochemical conversion technology development activities sponsored by the Biomass Energy Systems Program can be categorized into four main areas; direct combustion, direct liquefaction, gasification, and indirect liquefaction via synthesis gas. Pacific Northwest Laboratory (PNL) and Lawrence Berkeley Laboratory (LBL) have been selected to provide program management services to the Biomass Energy Systems Program. PNL is responsible for the technical management of development activities directed toward the thermochemical conversion of biomass feedstocks by direct combustion, gasification and indirect liquefaction via synthesis gas. LBL is responsible for the technical management of development activities on the direct liquefaction of biomass feedstocks. Biomass comprises all plant growth, both terrestrial and aquatic and includes renewable resources such as forests and forest residues, agricultural crop residues, animal manures, and crops grown on energy farms specifically for their energy content. Biomass production and conversion is considered a solar technology because living plants absorb solar energy and covert it to biomass through photosynthesis.

25291 Preliminary economic overview of large-scale thermal conversion system using wood feedstocks. Kohan, S.M. (Electric Power Research Inst., Palo Alto, CA). *ACS (American Chemical Society) Symposium Series ;* No. 130, 29-42(1980). (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

This paper presents a brief overview of the economics of conceptual technical schemes to convert woody biomass feedstocks into other, more useful energy and chemical forms. It is becoming increasingly clear that no single solution exists to the recurring domestic energy crisis. Rather, regional energy supplies (some renewable, some non-renewable) together with end-use energy management practices, are likely to play important roles in achieving stated national goals of energy self-sufficiency. Wood is a regional, renewable resource. DOE's Fuels from Biomass Branch is keenly interested in maximizing the cost-effective contribution of wood energy (as well as other forms of biomass) to the nation's energy supply. DOE awarded SRI International a contract in late 1977 to assist DOE in determining promising biomass feedstock/conversion technology/ product options for purposes of R & D program planning. This paper briefly reviews the data base for biomass thermal conversion technologies developed as a necessary part of this program planning effort. This analysis employs uniform design and economic bases. These are briefly reviewed, followed by summary economics for the production from wood of electricity, steam, and cogenerated products; intermediate-Btu gas (IBG) and substitute natural gas (SNG); methanol; ammonia; fuel oil; and pyrolytic oil and char. Several processing steps in these conversion schemes are conceptual or are at early stages of development by DOE, EPRI, GRI, and others (an exception would be wood steam/electric power plants, which are commercially used by the electric utility and wood products industries). Consequently, the economics presented here may generally tend to be optimistic.

25292 Wood gasification: an old technology with new potential for the eighties. Fritz, J.J.; Talib, A.; Gordon, J.J. (MITRE Corp., McLean, VA). *ACS (American Chemical Society) Symposium Series ;* No. 130, 43-56(1980). (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

Gasification of wood and wood residues using air and steam as the gasifying medium to produce a combustible gas is a technology which has been commercially available since the turn of the century. However, the advent of inexpensive fossil fuels phased this technology out of the market. Today, there is a renewed interest in revitalizing this old technology. Approximately two dozen private organizations are attempting to enter the commercial marketplace. MITRE conducted a study to assess the commercial readiness of wood gasification in the near-term. Several organizations involved in the manufacture and development of gasification technology were queried. Current status and systems costs were found to vary considerably. This paper summarizes the MITRE findings, giving both a state-of-the-art review and outlining policy related issues. Economic potential is assessed by considering a close-coupled wood gasifier as a source of gaseous fuel for an oil-and gas-fired boiler. The cost of wood-based fuel in three regions (federal planning regions), is compared with the cost of conventional fossil fuels for 1985 and 1990 under different economic scenarios. Results indicate that wood gasification is competitive in the New England and Mid-west regions by 1985. In the Northwest region, high wood prices prevent wood-based gas from being cost competitive even in a long-term (1990) comparison. Some government participation in the form of further R & D and financial incentives will be required to accelerate commercialization.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 25578, 25589, 25666, 25757

25293 (AD-B—028686/4) High temperature bonding techniques for solar cell array. Final report Mar 76-Jun 77. LaFontaine, G.; Marsh, F.; Levin, H.; Sinsheimer, F.; Wolff, G. (Hughes Aircraft Co., Los Angeles, CA (USA). Space and Communications Group). Nov 1977. Contract F33615-76-C-2032. 62p. NTIS, PC A04/MF A01.

An adhesive for solar cell attachment to spacecraft substrates has been sought with an unusually demanding combination of properties. These include (1) a basic resistance to decomposition at 600 C in vacuum, (2) retention of elastic properties at liquid nitrogen temperature, and (3) processibility as a bond line at conditions convenient to typical spacecraft fabrication. Of all the elastomeric materials available, the class of inorganic polymers termed poly (carboranesiloxanes) appears to be the only viable candidate. The ultrahigh molecular species of this group have been found to be attractive, especially when blended or alloyed with low molecular weight versions. This promising assessment is based on high temperature thermo-vacuum stability studies, various characterization measurements, elasticity measurements at cryogenic temperatures, and 45 peel studies of thermally cycled bond lines with varying adherend combinations. (Author)

25294 (DOE/CH/10003—1) [Impact of Satellite Power Systems on the Ionosphere]. Final summary report. (Department of Commerce, Boulder, CO (USA)). 1980. Contract AI02-79CH10003. 103p. NTIS, PC A06/MF A01. Order Number DE81023343.

Studies undertaken to assess the impact of the Satellite Power Systems upon the ionosphere are discussed. The material presented is directed toward effects in the ionosphere resulting from heating induced by the passage of the SPS microwave beam. Some topics included are: telecommunication system studies in a simulated SPS environment, and theoretical and experimental studies of the physics of ionospheric heating. (MHR)

25295 (DOE/ER/10160—T5) Alternate frequency analysis for the solar power system. Morrison, E.L.; Grant, W.B. (Department of Commerce, Boulder, CO (USA). Inst. for Telecommunication Sciences). 1981. Contract AI01-80ER10160. 47p. NTIS, PC A03/MF A01. Order Number DE81025323.

This is part of a series of reports dealing with the EMC evaluation of the proposed Solar Power System Reference Design. The alternate frequency consideration was required to indicate the character of functional and environmental effects for alternate power beam frequency ranges as one input to future engineering trade-off investigations. The basic conclusions from this task show that frequencies below the proposed 2.45 GHz are not recommended because of increased compatibility problems with a large population of existing systems and larger spacetenna and rectanna areas. Higher frequencies have increased troposphere interactions which would significantly reduce system efficiency during storm conditions. The increased media modulation effects at higher frequencies would greatly complicate the spacetenna control functions, including the stability of the main beam aim-point and side lobe amplitude control loops. Trade-offs and studies needed for higher frequencies are presented.

25296 (DOE/ET/20279—115) Analysis and test of line-commutated inverters for use in photovoltaic power systems. Landsman, E.E. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). Feb 1981. Contract AC02-76ET20279. 87p. NTIS, PC A05/MF A01. Order Number DE81025902.

The line-commutated inverter is currently being used in a number of utility-interactive photovoltaic power systems because it is both readily available and attractively priced. This inverter is basically a phase-controlled rectifier operating in the regenerative mode. Although existing analyses have emphasized the rectifier operation, there has been only minimal treatment of the regenerative mode. A detailed theoretical analysis, coupled with actual circuit measurements, is leading to a better understanding of the inverter operation and should result in an improvement in the power factor and a reduction of harmonic currents. The normalized results of the theoretical analysis and of test data and waveforms are presented.

25297 (DOE/NASA/0180—1) Market assessment of photovoltaic power systems for agricultural applications in the Philippines. Cabraal, R.A.; Delasanta, D.; Burrill, G. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center; DHR, Inc., Washington, DC (USA); ARD, Inc., Burlington, VT (USA)). Apr 1981. Contract AI01-76ET20485. 201p. (NASA-CR—165286). NTIS, PC A10/MF A01. Order Number DE81024958.

The following subjects are included: demographic overview;Philippine development plans; financing of energy, agriculture and development projects; potential photovoltaic applications in Philippine agriculture; market assessment; and business environment. The applications cover fish/prawn hatchery operations, irrigation, maintenance facilities, grinding and milling, fish cultivation, salt production, ice manufacture, and agricultural extension services. (MHR)

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 25224, 25225, 25347

25298 (DOE/SF/10499—T29) Thermal-storage-subsystem analysis report (RADL Item 5-1). (Rockwell International Corp., Canoga Park, CA (USA). Rocketdyne Div.). Feb 1980. Contract AC03-79SF10499. 539p. (SAN—0499-28; MDC-G—8273). NTIS, PC A23/MF A01.

Calculations and internal Rocketdyne memos generated in support of the Thermal Storage Subsystem design are presented. The calculations are presented informally, i.e., original hand calculations are included. General descriptions of computer programs are given where applicable. Correlation of experimental test results with model predictions are made. Environmental extremes are summarized. These extremes, together with Pilot Plant operating requirements, form the inputs to the analyses. Outputs of the thermal analyses in the form of temperatures and temperature gradients are used as inputs to the stress analyses. System level analyses are presented. Subsequent analyses are presented in the order of the WBS format, i.e., Thermal Storage Unit, heat exchangers, controls and instrumentation. The results of charging and discharging loop simulations are included. Subsystem level analyses include pressure loss calculations for both steam/water loops and for both oil loops. These pressure loss calculations provide sizing requirements for pumps, valves, pipes and other components.

25299 (DOE/SF/10499—T30) Failure modes and effects analysis (RADL Item 2-23). (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)). Apr 1980. Contract AC03-79SF10499. 186p. (SAN—0499-25; MDC-G—8221). NTIS, PC A09/MF A01.

The Pilot Plant is a central receiver design concept. It is comprised of five major subsystems as shown schematically, plus a set of equipment (Plant Support Subsystem) used to support total plant operation. The failure modes and effects analysis (FMEA) is a bottom-up analysis used to identify the failure characteristics of the system (total equipment used to produce electrical power), that is, the failure of a single component is assumed and the effect of that failure upon the system is determined. The FMEA is concerned with the plant from an operational standpoint (i.e., the production of electrical power). This analysis was performed to the component level. This was interpreted as a valve, computer, measurement sensor and its associated signal conditioning, an electronic black box, etc.

25300 (DOE/SF/10499—T31) 10-MWe Solar-thermal central-receiver pilot plant: solar-facilities design integration. Beam-characterization subsystem targets procurement documentation (RADL item 7-43). (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA); Stearns-Roger, Inc., Denver, CO (USA)). Jul 1980. Contract AC03-79SF10499. 66p. (SAN—0499-63; MDC-G—8561). NTIS, PC A04/MF A01.

The procurement documentation for the Beam Characterization Subsystem (BCS) Targets for the 10 MWe Solar Pilot Plant at Daggett, California, is presented. The purchase specification defines the technical requirements for the BCS targets.

25301 (DOE/SF/10499—T33) Heat and mass balance design analysis (RADL Item 2-15). (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)). Feb 1980. Contract AC03-79SF10499. 282p. (SAN—0499-47; MDC-G—8255). NTIS, PC A13/MF A01.

Heat and mass balance analyses are presented along with the engineering drawings for the various modes of operation. Electric power generation subsystem design reference cases are listed. (MHR)

25302 (DOE/SF/10499—T34) Plant-control-room design specification (RADL item 7-26): 10-MWe solar-thermal central-receiver pilot plant: solar-facilities design integration. (Stearns-Roger Engineering Co., Denver, CO (USA)). Sep 1979. Contract AC03-79SF10499. 12p. NTIS, PC A02/MF A01.

The general design criteria for the Plant Control Room and supporting areas that are required to provide control of the 10 MW Solar Pilot Plant are described. The general arrangements of areas and equipment in the second floor of the control room as well as the preliminary requirements for design of the plant control building and supporting facilities equipment are specified. (MHR)

25303 (MCR—78-1331A) Hazard analysis for 10 MW/ sub e/ solar thermal central receiver pilot plant. Supplement 1. Final report. Larsen, E.A.;. (Martin Marietta Corp., Denver, CO (USA). Denver Div.). 14 Aug 1979. Contract AC03-79ET21007. 28p. NTIS, PC A03/MF A01. Order Number DE81024308.

The Hazard Analysis consists of a systematic hazard identification and qualitative analysis of the collector subsystem and components in all operational modes and anticipated natural environments. The analysis identifies design criteria and operational constraints to eliminate or control accident potentials caused by human error, environment, deficiency/inadequacy of design, or component malfunction. Conditions that are suspect of having accident potential are indicated by a unique number and are documented on the Potential Hazard Matrix. The Hazard Analysis is summarized on the Hazard Catalog, Part I Hazards List, to provide current status of all identified hazards. Finally, the potential Hazard Matrix and the Hazard Catalog each trace through the unique number to the individual Hazard Analysis, a complete assessment of the accident potential of each identified hazard.

25304 (MDC-G—9330) Pilot-plant startup and acceptance-test plan (RADL Item 2-46). 10-MWe solar-thermal central-receiver pilot plant. Solar-facilities design integration. (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)). Dec 1980. Contract AC03-79SF10499. 192p. (SAN—0499-78). NTIS, PC A09/MF A01.

A test plan is provided for the pilot plant preoperational and acceptance test activities to be performed at the pilot plant test site located adjacent to the Coolwater Generation Station in Daggett, 12 miles southeast of Barstow in San Bernardino County, California. Presented is a description of the overall test program, the pilot plant system breakdown structure, preoperational and acceptance test specifications, and test management, data, and documentation requirements. Also presented as appendices are expanded pilot plant startup test schedules and a brief summary of startup-related construction tests.

25305 (SAN—0499-53) 10-MWe Solar-Thermal Central-Receiver Pilot Plant: solar-facilities design integration. BCS hardware and software specification (RADL item 3-2). (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)). May 1980. Contract AC03-79SF10499. 167p. (MDC-G—8527). NTIS, PC A08/MF A01.

The technical specifications for the Beam Characterization Subsystem (BCS) hardware of the Solar 10 MWe Pilot Plant are presented. The first part of the two part software design specification is to establish the requirements for performance, design, test, and qualification of a computer program identified as the Beam Characterization System. (MHR)

25306 (SAND—79-8189) Solar central receiver heliostat mirror module development. Hobbs, R.B. Jr. (USAEC Albuquerque Operations Office, NM; General Electric Co., Philadelphia, PA (USA). Advanced Energy Dept.). May 1981. Contract AC04-76DP00789. 186p. NTIS, PC A09/MF A01.

The design, development, and fabrication of a low cost, mass producible heliostat mirror module are described. Structural, optical, and economic trade-offs were evaluated in screening candidate materials and processes. A laminated sandwich design concept with aluminum facing sheets and a polystyrene honeycomb core was selected for the baseline design. The Silver-Vestar spray process was selected for direct metallization of 5657-H25 aluminum sheet, as a first-surface silvered reflector system. (MHR)

25307 (SAND—79-8192/1) Second-generation heliostat development. Volume 1. Detailed design report. Oldham, L.P. (Martin Marietta Corp., Denver, CO (USA)). Sep 1980. Contract AC04-76DP00789. 181p. (MCR—80-1369A-Vol.1). NTIS, PC A09/MF A01. Order Number DE81025027.

The results of a second-generation heliostat development program completed to date are presented. This includes a presentation of the detailed design of the second-generation heliostat with the supportive analyses and component test data; preliminary design of the manufacturing plant; and the projected cost to manufacture, transport, install, and maintain 50,000 heliostats per year installed in 50-MWe fields. The heliostat design presented is the mass production design on which the cost estimates were based. The prototype heliostats to be tested will be as close to the mass production design as practical. Due to the absence of mass production tooling, the prototype heliostats have some differences from the mass production heliostats. These differences are described at the component level where applicable.

25308 (SAND—80-8190) Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant. (Sandia National Labs., Livermore, CA (USA); Babcock and Wilcox Co., Lynchburg, VA (USA). Nuclear Power Generation Div.). Feb 1981. Contract AC04-76DP00789. 201p. (BAW—1662). NTIS, PC A10/MF A01. Order Number DE81024263.

Advanced thermal energy storage concepts were developed and evaluated which are applicable to a 100 MWe solar central receiver plant using water/steam as the working fluid. Operating conditions studied were 510C/10.1 MPa (950F/1465 psia) from the receiver and 299C/2.72 MPa (570F/395 psia) from storage. Three concepts were selected that offered potential for cost and performance improvements over the oil/rock concept presently being installed at the central receiver 10 MWe pilot plant under construction in Barstow, California. From the three concepts selected, the moving bed thermal energy storage system (MBTESS) using a free flowing refractory material as the heat transport and storage media was chosen. A conceptual design was developed, including estimates for cost and performance. Suggestions were made for further development work leading to full scale implementation of the concept.

25309 Binary Rankine-cycle engines for solar-thermal power systems. Abbin, J.P. Jr. (Sandia Lab, Albuquerque, NM). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-19, vp(Nov 1980).

Binary Rankine-cycle engines have the potential to provide thermal-to-electric conversion efficiencies of 40 percent or more at relatively moderate temperatures and pressures, e.g., 1000 F (538/degree/C) and 180 psia (1200 kPa). Even though moderate-temperature binary Rankine engines have been operated successfully in commercial service for many years, none are presently operated or under development. The reasons are discussed in this paper. 10 refs.

25310 High temperature solar thermal technology. Leibowitz, L.P.; Hanseth, E.J.; Peelgren, M.L. (JPL, Pasadena, Calif). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-20, vp(Nov 1980).

Development of high temperature technology for solar thermal energy is being pursued in order to achieve significant reductions in energy cost and increase the potential application of solar thermal energy. This paper describes some advanced technology concepts under development which have the potential for significant performance impact on solar thermal systems. Increased system efficiency is being pursued through the development of high temperature receivers, chemical and thermal transport, and advanced engines. 6 refs.

25311 Thermal storage requirements for parabolic dish solar power plants. Wen, L.; Steele, H. (JPL, Pasadena, Calif). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-21, vp(Nov 1980).

The cost effectiveness of a high temperature thermal storage system is investigated for a representative parabolic dish solar power plant. The plant supplies electrical power in accordance with a specific, seasonally varying demand profile. The solar power received by the plant is supplemented by power from fuel combustion. The cost of electricity generated by the solar power plant is calculated, using the cost of mass-producible subsystems (specifically, parabolic dishes, receivers, and power conversion units) now being designed for this type of solar plant. 12 refs.

25312 Alternative configurations for sodium-cooled solar thermal power plants. Pomeroy, B.D.; Salemme, R.M. (GE, Schenectady, NY). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Power Apparatus and Systems ;* **PAS-99**: No. 5, 2012-2019(Sep-Oct 1980).

A parametric analysis performed to determine the most promising sodium-cooled configuration is described. The selected concept has enclosed plastic heliostats arranged around a cylindrical external receiver. Sodium flow in the receiver is controlled by electromagnetic pumps to maintain a peak sodium temperature of 593/degree/C. The storage system consists of separate hot and cold tanks with flow throttling to maintain low pressure. Electricity is generated with a reheat steam turbine having steam conditions of 16.6 MPa/538/degree/C/538/degree/C.

1408 Ocean Thermal Gradient And Salinity Gradient Power Systems

REFER ALSO TO CITATION(S) 25658

25313 (CONF-810622—1) Ammonia condensation experiments at Oak Ridge National Laboratory. Domingo, N.; Michel, J.W. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01.

From 8. ocean energy conference; Washington, DC, USA (7 Jun 1981).

During the past year, work in ocean thermal energy conversion (OTEC) centered around the examination of heat transfer enhancement obtained for ammonia condensing on the outside of four aluminum tubes of three distinct types. These include a smooth tube, a single (external) fluted tube, and two double (internal/external) fluted tubes. Composite heat transfer coefficients (coefficients that include vapor-side plus wall resistance) are reported for a smooth tube condensing horizontally and at various tilt angles, and for a single-fluted tube condensing vertically. Overall heat transfer data are given for both double-fluted tubes. Various comparisons are made between the fluted tubes tested in this study and other tubes tested in earlier studies. Finally, a comparison is made with condenser tube bundle data obtained by Argonne National Laboratory (ANL).

25314 (CONF-810622—2) OTEC gas-desorption studies. Chen, F.C.; Golshani, A. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01.

From 8. ocean energy conference; Washington, DC, USA (7 Jun 1981).

OTEC gas desorption studies were initiated with the goal of mitigating these effects and were carried out in four areas: (1) vacuum deaeration in a packed column, (2) deaeration in a barometric water intake system, (3) noncondensibles disposal through hydraulic air compression, and (4) OTEC deaeration subsystems' analysis. Laboratory experiments to date have completed the vacuum deaeration test of three different kinds of packings, barometric intake deaeration experiments, and a series of hydraulic air compression tests. Preliminary analyses based on the experimental data have shown that, as compared to the previous baseline study, reduction both in deaerator cost and pumping power can be realized with a combination of barometric intake and packed column deaeration. The design and operation of the gas desorption test loop, experimental and computer simulation results obtained, and an analysis of OTEC deaeration subsystem design based on the test results and their implication on OTEC open-cycle power systems are presented.

25315 (CONF-810622—5) Direct-contact heat exchangers for OTEC: some advantages and disadvantages. Lyon, R.N. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE81024253.

From 8. ocean energy conference; Washington, DC, USA (7 Jun 1981).

Preliminary consideration of a direct-contact evaporator for OTEC discloses several advantages: (1) removing the corrosion and fouling problems associated with closed heat exchangers, (2) permitting the plant to operate at above atmospheric pressure in comparison with an open Claude system, and (3) reducing capital costs. More careful consideration discloses some disadvantages, however. Among the disadvantages is the potential loss of working fluid in the effluent seawater, for which there appears to be no state-of-the-art recovery process that does not require serious consumption of otherwise net power. Potential loss of working fluid in the condenser off-gases appears to require stringent deaeration of the seawater, again with serious consumption of otherwise net power.

25316 (DOE/ET/21056—T3) Ocean thermal energy conversion power system development-II. Phase II. Final design report. (Lockheed Missiles and Space Co., Sunnyvale, CA (USA). Ocean Energy Systems). 1 Jun 1981. Contract AC02-78ET21056. 160p. (LMSC-D—767601). NTIS, PC A08/MF A01.

The results are presented of the detailed design portion of the Power System Development (PSD)-II Phase II program. Included is a brief review of the results of the trade studies and related investigations accomplished during the Phase I program. The design and functional requirements for the 10-MW(e) power system and the 0.2-MW(e) heat exchanger test articles are listed. The primary objectives of the total program are given, and the Phase I effort is summarized. The major test article components are discussed in detail, and the related biofouling and corrosion countermeasures are discussed. Performance and diagnostic instrumentation and related data analysis, a proposed OTEC-1 test article installation, and a recommended plan for the conduct of the test program are presented. (LEW)

25317 (DOE/NOAA/OTEC—35) Theory and user manual for OTEC C. W. pipe programs ROTECF and SEGPIP. Paulling, J.R. (Paulling (J. Randolph), Inc., Orinda, CA (USA)). Jul 1980. Contract AI01-79CS20396. 193p. NTIS, PC A09/MF A01. Order Number DE81023736.

A quasi-linear frequency domain analysis of the coupled OTEC CW pipe and platform system has been developed. A finite element model of pipe structural dynamics is employed and the platform is modelled by contemporary ship or stable platform motion theory. Nonlinear fluid forces are included by means of the method of equivalent linearization. The procedure has proven to be

extremely versatile in its ability to represent various platform configurations and realistic directional random sea states. The F. E. representation of the CW pipe has the capability of dealing accurately with pipes having variable properties along the length and discrete irregularities such as flexible joints. An alternative procedure is presented for a pipe consisting of a number of rigid cylindrical segments linked together end to end. In this case, each segment is assumed to move as a rigid body linked to the members above and below, and the coupled equations of motion are solved. In both cases, the motions of nodes or joints are computed as well as the internal stresses or joint forces.

25318 **(DOE/NOAA/OTEC—36) Conceptual design study: cold water pipe systems for shelf-mounted OTEC powerplants. Final report.** (McDermott, Inc., New Orleans, LA (USA); Giannotti and Associates, Inc., Annapolis, MD (USA)). Feb 1981. Contract AI01-79CS20396. 82p. NTIS, PC A04/MF A01. Order Number DE81023737.

This study considers the conceptual design and installation aspects of CWP systems for shelf-mounted OTEC power plants in Puerto Rico and Hawaii. CWP systems using FRP (Fiberglass Reinforced Plastic) and steel have been designed: FRP, because the buoyancy of the pipe can be controlled by varying the core thickness; and steel, because of decades of successful use as a structural material in offshore applications. A marine railway approach was chosen for installation of the CWP. Two methods for pulling the track for the railway down the pipe fairway to final location are presented. The track is then permanently fastened to the sloping seabed with piles installed by a remotely controlled cart that rides on the track itself, thus minimizing deep water control problems. Both the marine railway and the shelf-mounted platform that houses the OTEC power plant must have an anodic or equivalent corrosion protection system, which would require the same inspection and maintenance procedures as currently used for offshore oil production platforms.

25319 **(LBL—11833) Preliminary evaluation of impingement and entrainment by ocean thermal energy conversion (OTEC) plants.** Sullivan, S.M.; Sands, M.D. (Lawrence Berkeley Lab., CA (USA); Interstate Electronics Corp., Anaheim, CA (USA). Oceanics Div.). Aug 1980. Contract W-7405-ENG-48. 16p. (CONF-800633—5). NTIS, PC A02/MF A01. Order Number DE81023046.

From 7. ocean energy conference; Washington, DC, USA (2 Jun 1980).

As part of the OTEC Environmental Assessment Program, the historical data from the candidate OTEC resource areas were examined and the effects of OTEC impingement and entrainment were assessed. The results of these investigations are presented. Suggestions to complete the OTEC site characterization are given when the available information is insufficient to assess the effects of an OTEC plant.

25320 **(SERI/TP—631-1270) Measured performance of falling-jet flash evaporators.** Green, H.J.; Olson, D.A.; Bharathan, D.; Johnson, D.H. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1981. Contract AC02-77CH00178. 9p. (CONF-810622—3). NTIS, PC A02/MF A01. Order Number DE81024355.

From 8. ocean energy conference; Washington, DC, USA (7 Jun 1981).

The rates of heat transfer and approach to thermal equilibrium of flash evaporators operating at pressures of 2 to 4 kPa are investigated. Experiments were performed to measure heat and mass transfer rates from falling jet evaporators operating in the temperature range of 18° to 30°C. The initial experimental results are given and the apparatus is described.

25321 **Ocean energy technologies: an environmental overview.** Lewis, L.F.; Waite, K.G. (US DOE). *Proceedings - Institute of Environmental Sciences ;* 420-426(May 1980). (CONF-800517—).

From 26. annual technical meeting of the Institute for Environmental Sciences; Philadelphia, PA, USA (11 May 1980).

Alternative ocean energy technologies within the Department of Energy (DOE) include Ocean Thermal (OTEC), Waves, Salinity Gradient and Current energy extraction. In general, these options, unlike other solar energy/heating systems, do not require energy storage for their continuous operation. DOE is vigorously conducting environmental assessments (EA's) in order to develop these technologies, from concept formulation through system selection and siting. In the case of OTEC, a system/site-specific EA was produced for the 1 MWe preoperational test platform (OTEC-1) to be sited off the coast of Hawaii. For the OTEC Pilot Plant, an EA will be prepared shortly. Programmatic level EA's for each of these technologies, considering eventual large scale deployments, are developed as each program matures. 23 refs.

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 24841, 24852, 24889, 25692, 25692, 25732, 25732, 25734, 25740, 25741, 25745, 25745, 25748, 25812, 25812

25322 **(ANL-K—81-74) Identification of product and material differences in active solar systems.** Weinstein, S.D. (Argonne National Lab., IL (USA); Ehrenkrantz Group, New York (USA)). 30 Sep 1980. Contract W-31-109-ENG-38. 81p. NTIS, PC A05/MF A01. Order Number DE81024455.

The goals of this report are to identify deficiencies in products and materials used in active solar systems as perceived by experienced practitioners within the solar design community in order to alert future designers and to provide feedback to manufacturers for future product development and/or improvement. The first section consists of comments elicited during indepth interviews with architects and engineers who have had a considerable amount of experience in solar projects. This experience falls into the following categories: design of solar installations; theoretical studies such as computer modeling, reliability and durability studies, etc.; project review; and construction administration. The second section pertains to manufacturers' response to comments made by the design community.

25323 (CONF-790203—, pp 48p, Paper 1) **Foreign travel report.** Dugan, V.L. (Sandia Labs., Albuquerque, NM). 1979. NTIS (US Sales Only), PC A25/MF A01.

From Solar energy symposium; Tokyo, Japan (5 Feb 1979).

This report describes the trip of Virgil L. Dugan, manager, Solar Energy Projects Department 4720, Sandia Laboratories, to attend the Interregional Symposium on Solar Energy for Development; February 5 to 10; Tokyo, Japan. This symposium was jointly sponsored by the United Nations and the government of Japan for the benefit of developing countries of Asia, Africa, and Latin America. I was invited to attend and provide input to the symposium as an UN expert; expenses were covered by the UN. The text of this report covers information gained or insights developed relative to developing (non-industrialized) and industrialized nations. Developing nations posed water pumping and food preservation as the first priorities for solar applications. They all are very interested in international agreements which provide them with technology; they seemed disinterested in and opposed to importing either manufactured solar hardware or operating and maintenance expertise. Of the industrialized nations, Japan appears to be the most progressive. Their largest activity is the current construction of two-1 MWe solar power plants which will be operative in the 1981 to 1982 time frame.

25324 (CONF-800438—, pp 141-154) **Designer's first experience with troglodyte subculture.** Levy, M.T. (Solar Designer, Fort Wayne, IN). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

A project, consisting of a 1900 ft^2 residence built into a southeast facing slope, and featuring an enclosed atrium courtyard open to the sky, in northeast Indiana is described. Construction information notes that: heating, ventilating, and air conditioning are achieved by means of a solar-assisted water-to-air heat pump with woodburning auxiliary; a unique low-cost solar collector was built on the site by embedding PVC plastic water pipe in an exterior concrete wall with glazing cover; thermal storage is contained in a 28,000 gallon insulated water tank located beneath the garage. The building construction system consists of an unconventional thin

shell sandwich wall of pneumatically placed concrete (shotcrete) and cavity filled with expanded polystyrene insulation board. Evaluation is given of methods and processes, costs, performance, and second thoughts. A brief review is given of the designer's other earth-sheltered projects in progress and solar and energy conservation products designed for production by local industries.

25325 (CONF-800438—, pp 185-186) **Affordable, earth sheltered, passive solar house.** Marcum, D.S. (Hobbittat, Inc., Lexington, KY). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

The incorporation of earth shelter and passive solar heating techniques, resulting in a 25 to 40% saving in capital investment and 80% annual saving in the fuel bill, in construction of a 2700 ft^2 2-story house, is discussed briefly. It was demonstrated that such a house could be constructed at 60 to 75% of the current cost of conventional housing.

25326 **(CONF-800804—40) Solar data base management system.** Singh, I.; Wolosewicz, R.M.; Singh, H.; Chopra, P.S. (Mohawk Coll., Hamilton, Ontario (Canada); Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01. Order Number DE81023122.

From ASME century 2 emerging technology conference; San Francisco, CA, USA (10 Aug 1980).

The data base management system that has been established at Argonne National Laboratory to handle the reliability and materials assessment data being generated by over 100 solar heating and cooling systems that are sponsored by the Department of Energy is described. The planning, the design, and some of the software used to handle data processing and reduction requirements are described. Examples of typical results from the library are presented.

25327 **(DOE/CS/10210—T1) Application of proactive behavioral techniques for the promotion of solar retrofit in condominiums: the Friars Village case study.** Mick, C.; Callahan, D.; Garcia, R.; Spielberg, F.; Mick, U. (Applied Communication Research, Inc., Palo Alto, CA (USA)). 6 May 1980. Contract AC01-77CS10210. 74p. NTIS, PC A04/MF A01.

The purpose of this project was to develop a program for marketing solar technology to the condominium market. As such, it was intended as a pilot study of retrofit solar water heating for multi-family residences. This objective was later expanded into developing a cooperative model with applicability to: residential housing (multi-family and single family high density); commercial buildings; retrofit and new construction; and water and space heating. An experimental program conducted in the Friars Village development in San Diego is described. The program provided residents with a structured approach to a solar analysis. It included: assessment of existing energy use; assessment of local attitudes concerning solar; review of local building codes affecting solar; analysis of the legal documents governing the condominium, selection of solar designers and contractors; solar system design alternatives; financing of systems; and other relevant information. Section II, provides background information on the development of the project and on the study site, Friars Village. Section III describes the original strategy for the project and the steps outlined to accomplish the goals set for the project. Section IV provides documentation for and results of the activities conducted during the course of the project. Section V provides some discussion of the lessons learned from the experience. (MCW)

25328 **(DOE/CS/30217—T1) Comparison of conventional and solar-water-heating products and industries report.** Noreen, D.; LeChevalier, R.; Choi, M.; Morehouse, J. (Science Applications, Inc., Golden, CO (USA)). 11 Jul 1980. Contract AC03-80CS30217. 299p. NTIS, PC A13/MF A01.

President Carter established a goal that would require installation of at least one million solar water heaters by 1985 and 20 million water-heating systems by the year 2000. The goals established require that the solar industry be sufficiently mature to provide cost-effective, reliable designs in the immediate future. The objective of this study was to provide the Department of Energy with quantified data that can be used to assess and redirect, if necessary, the program plans to assure compliance with the President's goals. Results deal with the product, the industry, the market, and the consumer. All issues are examined in the framework of the conventional-hot-water industry. Based on the results of this solar hot water assessment study, there is documented proof that the solar industry is blessed with over 20 good solar hot water systems. A total of eight generic types are currently being produced, but a majority of the systems being sold are included in only five generic types. The good systems are well-packaged for quality, performance and installation ease. These leading systems are sized and designed to fit the requirements of the consumer in every respect. This delivery end also suffers from a lack of understanding of the best methods for selling the product. At the supplier end, there are problems also, including: some design deficiencies, improper materials selection and, occasionally, the improper selection of components and subsystems. These, in total, are not serious problems in the better systems and will be resolved as this industry matures.

25329 **(DOE/CS/30245—T1) State incentives for passive solar commercialization.** Osborn, W.C.; Marks, M. (California Solar Business Office, Sacramento (USA)). Jun 1981. Contract AC02-79CS30245. 34p. NTIS, PC A03/MF A01.

Means by which state governments can influence development of a passive solar program are: information or education, incentives, and standards and regulations. Promotional programs in Missouri, New Mexico, Massachusetts, and at the Northeast Solar Energy Center are described.

25330 **(DOE/CS/30310—T1) Haverhill solar energy project: economic analysis.** (Columbia Gas System Service Corp., Columbus, OH (USA)). 16 May 1980. Contract FC03-79CS30310. 76p. NTIS, PC A05/MF A01.

In order to provide a common framework for analysis of different solar industrial process heat solar energy systems, DOE-SAN directed solar energy project contractors to determine annual required revenue and internal rate of return using the methodology developed by W.C. Dickinson and K.C. Brown (1979). With this economic analysis technique, certain system parameters; such as solar system installed cost, annual operating and maintenance cost, and net annual solar energy delivered to the industrial process; are estimated for the candidate solar energy system. Then annual required revenue, annualized cost of solar energy, and annualized cost of conventional energy are derived using discounted cash flow techniques. The annual fossil fuel savings and simple payback can also be calculated. Lastly, the internal rate of return on solar equity investment can be determined by trial and error or graphical techniques.

25331 **(DOE/CS/30310—T2) Haverhill solar energy project: preliminary design report.** (Columbia Gas System Service Corp., Columbus, OH (USA)). 7 Jan 1980. Contract FC03-79CS30310. 42p. NTIS, PC A03/MF A01.

The design of a solar energy system to provide 150 psi industrial process steam for the production of polystyrene is described. Following the analysis of the industrial process and the interface between plant and solar collectors, these components are discussed: solar collectors, heat transfer fluid, unfired steam generator, solar collector loop pumps, boiler feed system, fluid relief tank and solar collector loop makeup, back pressure regulator, piping insulation, steam generator blow down, solar system layout and component location, piping details, piping supports, electrical, system operation and controls and solar system safeties, and data acquisition system. (MHR)

25332 **(DOE/CS/30311—T2) Solar production of intermediate-temperature process heat, phase I design. Preliminary design report.** (Hilo Coast Processing Co., Pepeekeo, HI (USA)). 1 Jan 1980. Contract FC03-79CS30311. 80p. NTIS, PC A05/MF A01.

The preliminary design of the system including the results of the analyses that were performed to arrive at the preliminary design are outlined. The system consists of 44,100 ft^2 of parabolic trough concentrating solar collectors to be oriented in a north-south configuration and to track East-West. A heat transfer fluid will be circulated in a closed loop fashion through the solar collectors and a series of heat exchangers. The inlet and outlet fluid tem-

peratures for the collectors are 380°F and 450°F respectively. These temperatures will be constantly maintained via a variable flow rate through the collectors (the flow rate will vary in direct proportion to the level of insolation). Superheated steam will be the final product of the solar energy system. The plants' boiler feedwater at 245°F will be preheated to saturated liquid conditions at 180 Psig and 375°F in the first heat exchanger. It will then enter an unfired boiler where it will undergo a phase change to a saturated vapor. A third heat exchanger tube bundle located in the vapor region of the boiler will provide 25°F superheat for the steam. Final steam quality will be 400°F and 175 Psia.

25333 (DOE/CS/31521—T1) Oakmead solar buildings. (Pacific Sun, Inc., Palo Alto, CA (USA)). Mar 1981. Contract FC03-77CS31521. 161p. NTIS, PC A08/MF A01.

Twin 50,000 square feet industrial buildings, incorporating both active and passive solar design features, in the Oakmead Industrial Park, Santa Clara, California, employ slab floor construction and tilt-up concrete walls. A structural facia on the north extreme of each building provides a 45° support for approximately 2900 square feet of high-performance flat plate collectors. These liquid-based collectors form the basis for an active solar subsystem which includes a unique control logic to manage energy in a Second Law sense. The south-facing, vertical tilt-up concrete wall has been modified to accommodate some 1200 square feet of air-based collector fashioned after a Trombe design. The tilt-up wall fabrication technique is commonly used in commercial and industrial building construction, and shows promise for ready adaptation to passive solar heating applications. The combined active and passive subsystems were designed to provide approximately 90% of the annual energy requirements for heating and hot water.

25334 (DOE/CS/31522—T2) Solar space- and water-heating system at Stanford University. Final report. (Stanford Univ., CA (USA)). May 1980. Contract AB03-77CS31522. 143p. NTIS, PC A07/MF A01.

Portions of document are illegible.

Application of an active hydronic domestic hot water and space heating solar system for the Central Food Services Building is discussed. The closed-loop drain-back system is described as offering dependability of gravity drain-back freeze protection, low maintenance, minimal costs, and simplicity. The system features an 840 square-foot collector and storage capacity of 1550 gallons. The acceptance testing and the predicted system performance data are briefly described. Solar performance calculations were performed using a computer design program (FCHART). Bidding, costs, and economics of the system are reviewed. Problems are discussed and solutions and recommendations given. An operation and maintenance manual is given in Appendix A, and Appendix B presents As-built Drawings. (MCW)

25335 (DOE/CS/31590—) Development of a high temperature solar powered water chiller. Volume I. Phase II: technical progress report, June 1, 1978-March 31, 1979. English, R.A. (Carrier Corp., Syracuse, NY (USA). Energy Systems Div.). Mar 1979. Contract AC03-77CS31590. 227p. NTIS, PC A11/MF A01. Order Number DE81023559.

The project is to design, construct and test a 25 ton solar powered air cooled water chiller for multi-family and commercial applications. The design utilizes a dual loop Rankine power cycle driving a Rankine vapor compression cycle. The prime mover is a high speed turbo machine with a variable speed auxiliary electric motor. Simulations of a complete solar system were performed to evaluate various control strategies and to determine the economics of this chiller in a solar system. Detailed design calculations were made, for the heat exchangers and the rotating turbo machine. Detail and assembly drawings were made for the turbo machine and chiller package. Sealed tube thermal stability tests were performed on the working fluid (R-113) exposed to various materials of construction and temperatures up to 300°F for a period of 1700 hours. No deleterious effects were observed.

25336 (DOE/CS/34126—T1) Medium-temperature air-heater development program. Final report, October 1, 1977-December 31, 1978. (General Electric Co., Philadelphia, PA (USA). Space Div.). 15 Apr 1979. Contract AC04-77CS34126. 100p. NTIS, PC A05/MF A01.

A program to design, fabricate, and verify by test a low-cost (in volume production), modularized, practical solar air heater adaptable for new or retrofit space-heating and hot-water applications is described. The unique hardware elements of the SOLAIR II medium-temperature air heater described are the TCA solar collectors, energy transfer module, interconnecting ductwork, and mounting hardware. SOLAIR II is a two-tank domestic hot-water-augmented system. The system is described in detail; market and design analyses are described; fabrication procedures are noted; and design verification tests and results are discussed. The design used for the pre-production lot was essentially the SOLAIR II design and will serve as the basis for future design evaluations as the product is introduced into the commercial market.

25337 (DOE/CS/34135—T4) Solar Atrium: a hybrid solar heating and cooling system. (Ueland and Junker, Architects and Planners, Philadelphia, PA (USA); Drexel Univ., Philadelphia, PA (USA)). May 1981. Contract FG02-77CS34135. 26p. NTIS, PC A03/MF A01.

Solar Atrium is a hybrid system of solar heating and cooling consisting of a central atrium space having a south wall aperture with movable insulating/shading louvers and a rock thermal storage unit in the basement. In addition, the atrium contains an open pool which serves as thermal mass and a source of humidity. Back-up space heating and cooling is furnished by an air-to-air heat pump. Hot air is collected from the atrium ceiling and circulated by a fan through the rock bed and into the house duct system. A demonstration house in Philadelphia, Pennsylvania was designed, constructed, and monitored to test the concept. The project objective was to obtain thermal performance data for the house under normal occupancy conditions and to assess the concept with respect to functional and economic criteria. Temperatures, humidities, insolation, and electricity usage were monitored, and the results are discussed. Thermal performance is shown graphically. Construction cost for solar equipment is tabulated, and electric usage is tabulated month by month. Fuel consumption is compared to that for two conventional houses. (LEW)

25338 (DOE/CS/34697—T3) Series-parallel solar-augmented rock-bed heat pump. Final report. Sowell, E.F.; Othmer, P.W. (California State Univ., Fullerton (USA)). 31 Dec 1979. Contract AS02-78CS34697. 210p. (COO—4697-2). NTIS, PC A10/MF A01. Order Number DE81025221.

This report deals with a system representing an alternate arrangement of the components in an air-type, heat pump augmented solar heating system. In this system, referred to as Series-Parallel, the heat pump coils are at opposite ends of the rock bed, allowing heating and cooling of the air entering and leaving the bed. This allows a number of unique modes of operation, some of which allow off-peak use of the necessary utility power. Cooling modes are also available, including off-peak cooling-effect storage, night cooling, and free cooling (economizing). The system finds applications principally in single-family residences. The study examined the performance of this system at three locations (Sacramento, Albuquerque, and New York) by means of a simulation model. Seasonal heating and cooling performance factors of about 3 were obtained for Albuquerque for the system integrated into a 200 m^2 residence. Design integration studies suggest an installed cost of approximately $28,000 above a conventional heat pump system using commercially available components. This high cost is largely due to solar hardware, although system complexity also adds. Availability of low-cost air type collectors may make the system attractive. The study also addresses the general problem of predictive control necessary whenever off-peak storage is employed. An algorithm is presented, along with results.

25339 (DOE/ET/21067—T1) Report on alternate fuels manufactured from high temperature solar thermal systems. (New Hampshire Univ., Durham (USA). Dept. of Chemical Engineering). May 1980. Contract AC02-79ET21067. 74p. NTIS, PC A04/MF A01.

An assessment of potential resources of wood, peat, lignite, coal and oil-shale has been made. Their availability and regional distribution have been compiled. This study indicates that the solar-intensive regions of the United States are not at the same locale as where the above mentioned raw materials are available. The data

on insolation and solar thermal test facilities have also been compiled. Most of the research and development work in the gasification area has been conducted using coal as the feed stock. Therefore, coal gasification units have been taken as the base for the possible adaptation to using solar energy and for the economic analysis. Four gasification systems, namely British Gas-Lurgi, HyGas, BiGas, Co_2 Acceptor units, have been identified for the continuous production of substitute natural gas (SNG) using high temperature solar thermal energy to sustain the endothermic reaction and to produce steam. Conceptual hybrid gasification units have been presented and discussed. These units can accept any of the solid fuels as feed stock. The advantages of the solar hybrid gasification system over the conventional system are discussed. Capital and operating costs have been estimated to determine the cost of SNG. The total capital requirement and the average gas cost over the twenty-year depreciation period have been computed by the utility financing method for the years 1980, 1985, 1990, and 2000. The estimated gas costs do not include the cost of transportation from the plant to the actual gas user. This factor may become significant in the eastern locations where solar insolation is one-half of that in the south-western locations and the gas produced by solar gasification in the south may have to be transported to the east.

25340 **(DOE/NASA/CR—161730) Solar energy system economic evaluation for IBM System 1B, Carlsbad, New Mexico. Final report.** (National Aeronautics and Space Administration, Washington, DC (USA); IBM Federal Systems Div., Huntsville, AL (USA)). Sep 1980. Contract AI01-76CS31037. 100p. NTIS, PC A05/MF A01. Order Number DE81024944.

The economic analysis of the solar energy system that was installed at Carlsbad, New Mexico is developed for this and four other sites typical of a wide range of environmental and economic conditions in the continental United States. This analysis is accomplished based on the technical and economic models in the f-chart design procedure with inputs based on the characteristics of the installed system and local conditions. The results are expressed in terms of the economic parameters of present worth of system cost over a projected twenty year life: life cycle savings, year of positive savings and year of payback for the optimzed solar energy system at each of the analysis sites. The sensitivity of the economic evaluation to uncertainties in constituent system and economic variables is also investigated.

25341 **(DOE/NASA/CR—161756) Solar heating and hot water system installed at Alderson Broaddus College, Philippi, West Virginia.** (Alderson Broaddus Coll., Philippi, WV (USA); Sturm (J.E.), Inc., Clarksburg, WV (USA)). May 1981. Contract FC01-78CS35228. 90p. NTIS, PC A05/MF A01. Order Number DE81024141.

The Solar Energy System installed in a 51,120 ft^2 building at Alderson Broaddus College is an active heating and hot water system using an anti-freeze solution as the medium of exchange. The system consists of 3150 sq feet of Sunworks flat plate collectors which are single glazed and have copper absorber plates with enthone absorber coating. Storage consists of two (2) 3000 gallon steel storage tanks with a maximum storage capacity of 6000 gallons. Such information as system descriptions, acceptance test data, schematics, as built drawing, problems encountered, all solutions, and photographs of the system at various stages of completion are presented.

25342 **(DOE/R5/10112—T1) Alternate Home Energy Application and Demonstration: Project AHEAD. Final report.** (Illinois Central Coll., East Peoria (USA)). 1 May 1981. Contract FG02-79R510112. 78p. NTIS, PC A05/MF A01.

The completion of a demonstration and experimental free energy house, Project AHEAD, (Alternate Home Energy Application and Demonstration), is announced. The AHEAD facility exemplifies an energy-efficient, moderate-cost, solar-assisted home. This exemplary structure includes three types of passive solar concepts: a trombe wall, a greenhouse, and a direct-gain area. Participating personnel involved in the project are listed. A summary of the project activities and a description of the facility are presented and future projects are noted. Attachments to the report include: Illinois Central College 1981-1982 Budget for Project AHEAD; Promotional Materials; Calculations of the Performance of the AHEAD House; Draft of Laboratory Manual for Physics.

25343 **(EPRI-EM—1866(Vol.2)) Solar heating and cooling (SHAC) simulation programs: assessment and evaluation. Volume 2. Detailed findings. Final report.** Merriam, R.L. (Little (Arthur D.), Inc., Cambridge, MA (USA)). May 1981. 247p. NTIS, PC A11/MF A01.

Solar heating and cooling system simulation programs available to use by electric utilities are identified, analyzed, tested and evaluated. Those studied range from simple design tools to sophisticated research tools. No single program is recommended as being best. The strengths and weaknesses of the more promising programs are highlighted. A comprehensive reference manual describing the characteristics of computer programs and manual methods was developed. An analysis of the intended capabilities of eleven programs (AXCESS, BLAST, DEROB, EMPSS, EP, FCHART, HISPER, SOLCOST, TRACE, TRNSYS, WATSUN) is carried out. The programs are described and ranked by application. Four programs (AXCESS, DEROB, EMPSS, TRNSYS) are tested for three building types (residential, light commercial, heavy commercial) and three heating and cooling system classes (conventional, active solar, passive solar). The results are compared and related to the program's analytical bases. The user experience encountered during the program testing is highlighted and user-related factors for the four programs are compared. The applicability of the eleven programs to utilities is explored.

25344 **(HUD-PDR—548) Hot water from the sun: a consumer guide to solar water heating.** McPherson, B. (Franklin Research Center, Philadelphia, PA (USA)). May 1980. 126p. NTIS, PC A07/MF A01. Order Number DE81025037.

This guide addresses the use of a solar energy system to heat the water used in a home - either for a new home or to be installed (or retrofitted) in an existing home. A general understanding of solar energy and the various types of systems used to provide solar heated water, a method to estimate the costs and potential savings from using such systems, and how to select a specific system and choose the best way to have it installed are discussed. The guide stresses the importance of proper installation. Some technical information on system efficiencies has been included as an appendix.

25345 **(HUD-PDR—589) Survey of passive solar homes.** (AIA Research Corp., Washington, DC (USA)). Jun 1980. 106p. NTIS, PC A06/MF A01. Order Number DE81025022.

This survey illustrates some of the many examples of passively heated and cooled homes found throughout the country. More than 300 homes are described or listed. The country is divided into four regions. Within each region, case studies of selected projects are presented state-by-state. These case studies are followed by a directory that identifies additional passive homes located in that region. Each regional section begins with a brief sketch of the region's climate with maps showing average annual heating degree days and average daily solar radiation for December. Case studies are listed, numbered and plotted on a large map of the region. Each case study begins with a thumbnail sketch of the project. Information on each case includes the following: location, project title, designer's name and address, building type, conditional area, heating load, heating degree days, solar fraction, collection area, storage capacity, system description, and references. Photographs are included.

25346 **(HUD-PDR—664) New energy-conserving passive solar single-family homes. Cycle 5, Category 2 HUD solar heating and cooling demonstration program.** (Department of Housing and Urban Development, Washington, DC (USA). Office of Policy Development and Research). Jan 1981. 283p. NTIS, PC A13/MF A01. Order Number DE81025036.

The 91 new single-family, energy-conserving passive solar homes described represent award winning designs of the series of five demonstration cycles of the HUD program. Information is presented to help builders and lenders to understand passive solar

design, to recognize passive solar buildings, and to provide specific design, construction, and marketing suggestions and details. The first section describes the concept of passive solar energy, explains the various functions which passive solar systems must perform, and discusses the various types of passive systems found in the Cycle 5 projects. The second section discusses each of the 91 solar homes. The third section details the issues of climate requirements and site design concerns, gives examples of building construction, and suggests how to market solar homes. The appendices address more technical aspects of the design and evaluation of passive solar homes.

25347 **(SAND—81-8223) Central receiver steam systems for industrial process heat applications.** Fish, J.D.; DeLaquil, P. III; Faas, S.E.; Yang, C.L. (Sandia National Labs., Livermore, CA (USA)). Apr 1981. Contract AC04-76DP00789. 36p. NTIS, PC A03/MF A01.

Various central receiver technologies for supplying 550 and 350°F saturated steam for industrial process heat applications are compared. Conceptual designs of systems based on molten salt, water/steam, and oil receivers were derived, where possible, from earlier work within the Department of Energy Solar Thermal Program. Systems include either molten salt or oil/rock storage subsystems. Cost estimates of delivered energy over a capacity factor range from 0.27 to 0.67 are reported. For conditions of little or no storage several different technologies can be used to supply saturated steam for industrial process heat applications at roughly equal costs. For systems with large amounts of storage, the results clearly demonstrate the advantages of collecting energy at temperatures higher than the application temperature. A significant implication of this study is that process steam represents an additional market for the 1050°F molten salt receiver system currently receiving program emphasis for electrical power production. All of the work in support of that effort is directly applicable and timely for this industrial application.

25348 **(SERI/TP—353-467) Industrial applications analysis: market characterization and system definition for several industries.** Brown, K.C.; Ketels, P.A.; Stadjuhar, S.A. (Solar Energy Research Inst., Golden, CO (USA)). Nov 1979. Contract AC02-77CH00178. 7p. (CONF-791024—15). NTIS, PC A02/MF A01. Order Number DE81024940.

From Solar industrial process heat conference; San Francisco, CA, USA (31 Oct 1979).

A program to characterize the industrial process heat market by industry and location to identify key market sectors and to evaluate the feasibility of solar applications within specific industries is described. The fluid milk dairy industry was chosen for in-depth analysis. A brief discussion of the results of the analysis is presented.

25349 **(SERI/TP—641-1222) Application of solar thermal energy to buildings and industry.** Kutscher, C.F. (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH00178. 31p. (CONF-810808—6). NTIS, PC A03/MF A01.

From Energy in the man-built environment: the next decade specialty conference; Vail, CO, USA (3 Aug 1981).

Flat plate collectors and evacuated tube collectors are described, as are parabolic troughs, Fresnel lenses, and compound parabolic concentrators. Use of solar energy for domestic hot water and for space heating and cooling are discussed. Some useful references and methods of system design and sizing are given. This includes mention of the importance of economic analysis. The suitability of solar energy for industrial use is discussed, and solar ponds, point-focus receivers and central receivers are briefly described. The use of solar energy for process hot water, drying and dehydration, and process steam are examined, industrial process heat field tests by the Department of Energy are discussed, and a solar total energy system in Shenandoah, GA is briefly described. (LEW)

25350 **(SERI/TR—98348-1) Solar industrial process heat: a study of applications and attitudes. Final report.** Wilson, V. (Insights West, Inc., Los Angeles, CA (USA)). Apr 1981. Contract AC02-77CH00178. 75p. NTIS, PC A04/MF A01. Order Number DE81024941.

Actual field data are provided on potential near-term (within 5 to 7 years) industrial markets for solar thermal technologies. Data were gathered through site visits to 100 industrial plants, representing fourteen industrial groups, as identified by 2-digit Standard Industrial Classification codes (SICs), and geographically distributed over 31 states. The site specific data suggests several possible near-term market opportunities for solar thermal energy systems. Plants using electricity as their primary fuel for industrial process heat were identified, on the basis of their high fuel prices, as attractive early-entry markets for solar energy. Additional opportunities were reflected in plants that had accomplished much of their conservation plans, or had sizeable percentages of their operating budgets committed to energy expenses. A suitability analysis identified eleven industrial plants as highly suitable for solar thermal applications, they included producers of fluid milk, pottery, canned and bottled soft drinks, fabricated structural metal, refined petroleum, aluminum cans, chrome and nickel plating and stamped frame metal and metal finishings.

25351 **(SOLAR/0022—81/39) Performance of passive-solar space-heating systems. Comparative report, 1979-1980 heating season.** Pollock, E.O.; Sersen, S.J.; Miller, P.C. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1980. Contract AC01-79CS30027. 106p. NTIS, PC A06/MF A01. Order Number DE81025216.

Data and information are provided on three passive space heating sites of the NSDN. In addition to the three systems monitored for the full 1979/1980 heating season, nine other passive sites were instrumented and some data collected during this period. Detailed analysis and comparison of the three fully monitored sites, and qualitative analysis of the other sites are presented. General comments on system performance and problems are included.

25352 **(SOLAR/2038—81/14) Solar-energy-system performance evaluation: Dallas Recreation Center, Dallas, Texas. March-November 1980.** Eck, T.F. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1980. Contract AC01-79CS30027. 94p. NTIS, PC A05/MF A01. Order Number DE81024098.

Use of solar energy to heat and cool the health care clinic, the gameroom, and the lobby at the Dallas Recreation Center is described. The active solar energy system is designed to provide 80% of the heating load, 90% of the hot water requirements, and 48% of the cooling load. The system utilizes 4258 square feet of liquid flat-plate collectors; 6000 gallons of hot storage and 2000 gallons of cold storage; and a natural gas hydronic system for auxiliary space heating, natural gas domestic hot water heater, and cooling auxiliary from direct expansion electric air conditioning units. Data are compiled on the energy saved and the coefficient of performance from March until November of 1980. The solar system operated below expectations during the testing period, but it supplied 34% of the building energy demand. Total operating energy during the test period is noted and weather conditions are summarized. (MCW)

25353 **Enhancing passive solar heating of commercial greenhouses.** Albright, L.D.; Langhans, R.W.; White, G.B.; Donohoe, A.J. (Cornell Univ., Ithaca, NY). *ASAE Publication ;* No. 4-81, 509-512(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

A passive solar greenhouse heating system is detailed which includes: (1) a highly insulated night curtain, (2) augmented thermal mass, (3) variable greenhouse temperatures to expand the daily temperature range, (4) optimized control of the night curtain, and (5) a microprocessor controller to improve energy management. Performance as a function of daily solar insolation, long term performance, and plant growing responses are among the parameters reported to characterize the system. A deployment mechanism for the night curtain is described.

25354 **Analysis and summary of a solar air collector-groundwater heat storage-greenhouse heating system.** Dale, A.C.; Puri, V.M.; Barrett, J.R.; Hammer, P.A. (Purdue Univ., West Lafayette, IN). *ASAE Publication ;* No. 4-81, 513-523(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

An air-type solar energy collector with reflective wings at the top and bottom was developed and adapted to heat a soil and groundwater heat storage from which energy was reclaimed to heat a greenhouse. Collector efficiency correlation for summer and winter months are presented for seasonal collector tilts of 30° and 60°, respectively. The collector performance data and correlations show that summer performance on an average was 30 percent better than winter months. In addition, a model for the determination of solar radiation augmentation due to reflectors is presented. The model shows total radiation increments of 25 percent and 18 percent for summer and winter seasons, compared to average reported value of 22 percent. A three dimension finite difference unsteady state model for determining heat transfer to and from pipes buried in soil was developed. Validation was done by comparing the actual and pedicted hourly soil temperature distribution values for typical summer and winter days. The standard deviation between actual and predicted hourly soil temperature values was + 0.83°C. The greenhouse subsystem performance was documented by showing the weekly breakdown of a typical winter season heating requirement supplied by the solar and auxiliary heating systems. Only about 5 percent of the heating requirement was supplied by the solar system. This low system efficiency was attributed to the inability of storage unit to retain heat for an extended period of time due to rapid heat loss to the surroundings.

25355 **Low temperature solar heating of greenhouses.** Mears, D.R.; Roberts, W.J.; Simpkins, J.C.; Janes, H.W. (Rutgers Univ., New Brunswick, NJ). *ASAE Publication ;* No. 4-81, 536-539(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Increasing insulation reduces the fossil fuel requirement for backup energy and allows the floor storage, which is also the primary heat exchanger for the building, to operate at a lower temperature. The solar collectors for this system were developed according to plastic film greenhouse construction practices. A black plastic film, which serves as the collector absorber plate, is sandwiched between two air-inflated pairs of clear, greenhouse grade, polyethylene film. The inflated sections provide structural support and some insulation for the absorber plate. Water flows over the black plastic film and after being warmed, drains back into the greenhouse floor. The entire system has been shown to be effective, markedly reducing fossil fuel energy requirements. A large plastic bag for underbench storage and heat exchange has been developed. Capacities for energy storage and heat transfer comparable to the flooded floor system can be obtained. Prelimminary investigations on the internal collection of solar energy using water collectors and the flooded floor storage indicate potentially promising results. However, light levels in the greenhouse are significantly reduced, and more work is needed to determine the feasibility of this concept.

25356 **Kube Pak commercial greenhouse solar demonstration project.** Cipolletti, J.P.; Mears, D.R.; Roberts, W.J.; Kendall, P.W. (Rutgers Univ., New Brunswick, NJ). *ASAE Publication ;* No. 4-81, 540-544(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

A 0.54-hectare greenhouse was constructed as a demonstration project. The facility was composed of several elements that constitute a solar heating system developed at Rutgers University. These components include a flooded floor storage/heat exchange system, insulating curtains, plastic film solar collectors, and a backup heating system. The project objectives included determining the feasibility of constructing the system on a large scale, evaluating the thermal performance of the system and individual components, and determining if the facility could be effectively operated and maintained. Results indicated that the system could be effectively constructed and operated on a large scale. The large solar collector field operated as predicted by theoretical projections based on testing of smaller units, and contributed better than the projected 25 percent contribution to the energy budget on several occasions. The curtain insulation system performed well, a reduction in the base energy requirements of the structure of up to 50 percent being recorded with some curtain material combinations tested. A change in management practice encouraged by the warm floor allowed a further reduction in the greenhouse energy load. Fuel consumption of the greenhouse was reduced considerably by the system: 45 percent the first year, 73 percent for the fall 1979 season, and 69 percent for the spring 1980 season, compared with a neighboring check section.

25357 **Solid desiccant regeneration by direct solar energy for fresh fruit drying.** Miller, W.M. (Univ. of Florida, Lake Alfred); Bowman, E.K. *ASAE Publication ;* No. 5-81, 581-585(1981). (CONF-8009144—(Vol.3)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Direct solar drying was investigated to regenerate activated alumina and silica gel for their subsequent use as an energy store. The contemplated application is for dehumidification to condition air to a low absolute humidity. The air would then be used to dry surface moisture from whole fruit in packinghouse applications. Both desiccants were regenerated to less than 66 percent of their initial moisture content. Variables studied were: air flow rate, desiccant loading and type of desiccant. Solar efficiency was calculated based on total insolation, moisture loss and the heat of adsorption. Both total moisture loss and solar energy utilization were positively correlated with total moisture available for vaporization. Overall utilization levels ranged from 18.4 to 27.3 percent for silica gel over 12-h (2 days at 6 h) test period. An energy balance of the solar drying process indicated substantial losses in the exhaust air stream, through thermal losses and by transmittance-absorptance reductions. With the partial regeneration accomplished in flat-plate tests, volumetric energy capacity for silica gel is significantly greater than rock bed or water systems. A moisture content spread of 17.5 percentage points is equivalent to a water temperature rise of 112°C for equal storage volumes. Research is continuing with an integrated fruit drying unit and a continuous belt regenerator.

25358 **Use of solar concentrated brines for food processing.** Schwartzberg, H.G.; Rosenau, J.R.; Kim, K.H.; Yanniotis, S. (Univ. of Massachusetts, Amherst). *ASAE Publication ;* No. 5-81, 586-591(1981). (CONF-8009144—(Vol.3)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Experiments and results on evaporative concentration and freeze concentration techniques using solar energy instead of fuel are described. The use of multiple-effect evaporation and freeze concentration to permit reductions in solar collection, salt acquisition, and brine storage costs are discussed. (MHR)

25359 **Solar drying of seafood products.** Baird, C.D.; Deng, J.C.; Chau, K.V.; Heinis, J.J.; Perez, M. (Univ. of Florida, Gainesville). *ASAE Publication ;* No. 5-81, 640-644(1981). (CONF-8009144—(Vol.3)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

The solar drying of seafood products by forced air convection and by direct insolation, as well as hot smoking fish with a solar assisted fish smoker are investigated.

25360 **Dynamic modeling and experimental simulation of active solar energy systems for the evaluation of control strategies.** Schiller, S.R.; Warren, M.L.; Wahlig, M. (Univ of Calif, Berkeley). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-14, vp(Nov 1980).

Dynamic modeling and experimental simulation are used to evaluate control strategies for active solar energy systems. Performance of proportional and on/off collector loop controllers are evaluated and compared using a theoretical dynamic collector model. Use of the experimental test facility at Lawrence Berkeley Laboratory for evaluating the affect of controls and control strategies on hydronic space heating system performance is also discussed. 15 refs.

25361 **Solar energy systems for agricultural and industrial process drying.** Auer, W.W. (US DOE, Washington, DC). pp 280-292 of Drying. Washington, DC; Hemisphere Publ Corp (1980).

From Drying '80 conference; Montreal, Quebec, Canada (7 Jul 1980).

Paper describes advances in the use of solar energy in on-farm agricultural and industrial process drying applications. USDA-ARs research projects in solar drying of tobacco, peanuts and grains are presented. Solar energy heating systems for industrial process drying of soybeans in Alabama, raisins and prunes in California, and lumber drying in Mississippi, are discussed. 8 refs.

25362 **Earth tempering as a passive design strategy.** Labs, K. (Undercurrent Design Research, New Haven, CT). pp III.5-III.10 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Fundamental climate control strategies availble to the architect, among which are such familiar techniques as insulation, thermal mass, natural ventilation, passive solar heating, and evaporative cooling are discussed. Earth tempering design practices satisfy many of these simultaneously - and may be at conflict with others. The balance of benefits and possible disadvantages of building below ground will depend on local climatic factors, and on the nature of individual designs. A procedure is presented for analyzing local climates by establishing the relative priority of the fundamental climate control strategies. The procedure summarizes the percentage number of hours that each of the strategies is applicable in any location for which the necessary weather data is available. Insights into the climate conditioning role of earth tempering are provided by viewing the comfort problem in this way. Computer-analyzed summary data for four geographic regions of the United States is presented for illustration.

25363 **Operation characteristics of a utility-free dwelling in Kansas.** Pick, E. (Energy Productions, Concordia, KS). pp IV.5-IV.8 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

A new technology, subterranean temperature modification, employed to alter sub-grade wall temperatures enhancing the heating and cooling requirements of a structure, is discussed. The operating costs of a two-story house in Kansas, the architectural design, and the wind charger electric system are described. Wind power is used to pump the domestic water which is stored and gravity fed into the dwelling. Hot water is supplied by an active solar system. (MCW)

25364 **Energy performance of an earth sheltered active solar house.** Stewart, D.R. (Stewart Enterprises, Inc., Wichita, KS). pp IV.11-IV.15 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Some broad operating results of an earth-sheltered active solar house in Kansas are described. Details about the house, the systems, and construction conditions are given. The mechanical systems are typical of most active solar air systems. The living conditions and problems are described. Heating load calculations are presented and a representation of the operating results of the house since 1978 are charted. Energy consumption of five different house types near Wichita is compared. (MCW)

25365 **Earth sheltered passive solar structures: occupant comfort and energy use.** Emery, A.F.; Heerwagen, D.R.; Kippenhan, C.J. (Univ. of Washington, Seattle). pp IV.35-IV.40 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

The thermal performance of an existing earth sheltered passive solar structure has been studied by numerical simulation using the finite difference program UWENSOL. The economics of energy use resulting from the embedding of structures in the ground are related to the insulation and storage characteristics of the building and to the surrounding earth mass. The additional benefits of passive solar utilization in such massive embedded structures are amplified by the synergetics of solar source and large storage mass. Studies of occupant comfort in these rather unusual environments are addressed by rational comfort calculations which utilize the Fanger model. The effect of very asymmetrical thermal radiation is treated by precise and rational computational procedures. The results of these simulation calculations are related to the observed temperature response and to the occupant perception of comfort in the actual structure which was numerically studied. The comparisons illustrate the value of and the efficiency of such simulations in exploring unknown and untried design features, long before a design is fixed and without requiring prototypical experimentation or demonstration. Presented are results of a simulation of a typical Seattle house with one floor completely above grade and the other floor primarily below grade.

25366 **Design/development process for Underhill, a residence.** Wheeler, E.M. (Wheeler and Wheeler Architects, Enid, OK). pp V.5-V.13 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Designing and developing an earth-sheltered house in Enid, Oklahoma are described. The scheme utilizes passive solar energy for heating, plenty of windows for air and light, and a lower level sunk into the hillside as a refuge from severe storms and temperature extremes. The floor plan of Underhill, the name of the house, is described. Other features discussed are: selection of the structural system; environmental systems; insulation; parapet walls; walls between zones; survival comfort; energy efficiency; moisture proofing; condensation; erosion control;skylights; interior design considerations. (MCW)

25367 **Consumer evaluation of an earth sheltered solar residence.** Stewart, K.K. (Oklahoma State Univ., Stillwater); McKown, C. pp VI.31-VI.35 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Consumer evaluation data collected during open-house tours of an experimental house at Clemson University in South Carolina are analyzed. Select environmental and consumer design features are addressed, as well as the personal characteristics of the respondents. The two bedroom house consists of 1080 f^2 of heated floor space. The unit is partially embanked in earth on three sides with the south facade exposed. The primary heating source is a 412 f^2 solar collector located on the roof. The first objective was to obtain consumers' evaluation of selected design features of an experimental earth sheltered solar house including size, spatial arrangement, lighting, privacy, access, expected maintenance costs, and energy efficiency. The second objective was to analyze the relationship between the desire to live in an earth sheltered dwelling and consumer characteristics and attitudes about the research house. An attempt was made to identify the potential market for such housing. It is concluded that there is considerable consumer interest in earth sheltered living. (MCW)

25368 **European community solar housing.** London, England; International Solar Energy Society (1980). 93p. (CONF-8007101—).

From International Solar Energy Society conference on European community solar housing; London, UK (Jul 1980).

Separate abstracts have been prepared for 9 papers in this conference. (LEW)

25369 **Solar housing in London.** Summers, R. pp 1-17 of European community solar housing. London, England; International Solar Energy Society (1980).

From International Solar Energy Society conference on European community solar housing; London, UK (Jul 1980).

Two solar housing projects are described. The first relies heavily upon direct gain and thermal mass. The second project is a demonstration program using flat plate collectors to heat a system of connected 3-story buildings. The architecture, heating system, and costs are described for each case. (LEW)

25370 Passive solar in Milton Keynes. Doggart, J. (Milton Keynes Development Corp., England); Everett, R. pp 19-26 of European community solar housing. London, England; International Solar Energy Society (1980).

From International Solar Energy Society conference on European community solar housing; London, UK (Jul 1980).

Pennylands and Linford 8b are two passive solar energy projects in Milton Keynes. Both set out to estimate the practical benefits of direct gain passive solar house design. The Pennylands project does this by using limited monitoring on a large sample of about 200 houses. The Linford 8b project aims to do this by intensive monitoring of eight houses.

25371 Group solar housing. Maw, R.; Grove, S.; Thring, J. (Polytechnic of Central London, England). pp 45-63 of European community solar housing. London, England; International Solar Energy Society (1980).

From International Solar Energy Society conference on European community solar housing; London, UK (Jul 1980).

Some preliminary results are presented from a study of the cost-effectiveness of active solar energy systems which provide both space heating and domestic hot water. The calculation of payback periods based on the repayment of a mortgage is explained, and data from the PCL Solar House are used to demonstrate the economics of an individual system. A design for a larger, more sophisticated solar heating system to be shared by a group of nine terraced houses is described. Results from an hourly computer simulation are combined with cost estimates to give payback periods over a range of interest rates and fuel price increases. A small but significant advantage for the group scheme is evident, and there is considerable scope for improvement - both by increasing the energy savings and by reducing the system capital cost.

25372 Solar housing in Italy: a project in Pisa. Cuozzo, L. (APRE Solar SpA, Rome, Italy). pp 65-74 of European community solar housing. London, England; International Solar Energy Society (1980).

From International Solar Energy Society conference on European community solar housing; London, UK (Jul 1980).

The environment in which the solar project, a four-story, forty-apartment low-rise building, was born is described. Italy's state-owned oil company, AGIP, and the Institute for Low-Income Housing (IACP) selected this building as an experimental case for defining how a cooperation might work, aimed at reducing the net energy consumption in the building. By a special agreement, AGIP guarantees a given energy saving. Economical and technical constraints imposed by Italian housing laws are tabulated, as are the parameters used to estimate energy costs and the cost effectiveness of the design proposal. The building design is outlined and illustrated and average monthly temperature and insolation data are given. (LEW)

25373 Solar housing in the Netherlands. Leijendeckers, P.H.H. (Van Heugten Consulting Engineers, Nijmegen, Netherlands). pp 75-76 of European community solar housing. London, England; International Solar Energy Society (1980).

From International Solar Energy Society conference on European community solar housing; London, UK (Jul 1980).

Several projects for using solar energy for space heating and domestic hot water are listed. (LEW)

25374 Solar housing in Sweden. Isakson, P. (Royal Inst. of Technology, Stockholm, Sweden). pp 77-79 of European community solar housing. London, England; International Solar Energy Society (1980).

From International Solar Energy Society conference on European community solar housing; London, UK (Jul 1980).

The Swedish solar heating program is briefly described. Seasonal heat storage in central systems, particularly heat storage in water, the use of solar energy in conventional district heating, and chemical heat storage/heat pumps are discussed. (LEW)

25375 Solar housing in Denmark. Kristensen, P.E. pp 81-91 of European community solar housing. London, England; International Solar Energy Society (1980).

From International Solar Energy Society conference on European community solar housing; London, UK (Jul 1980).

The state of the art within solar housing in Denmark is presented. Since Denmark is very dependent upon imported fuels, it is essential to develop internal energy sources, conventional as well as alternative. A solar heating R and D programme was initiated in 1977, with a total grant of £ 1.4m until the end of 1981. The solar heating demonstration programme is a part of this, and it covers eight solar heating systems on different types of buildings. A number of solar assisted low-energy houses are presented. Some of these are only allowed to consume 5000 kWh of auxillary energy for space heating and DHW (domestic hot water). Until now only first generation solar houses have been built, but the experiences from these houses show that second generation houses of improved design, reliability and output can be built.

25376 Stabilized CVD amorphous silicon for high temperature photothermal solar energy conversion. Booth, D.C.; Allred, D.D.; Seraphin, B.O. (Univ. of Arizona, Tucson). Contract ER-78-S-02-4899. *Solar Energy Materials ;* **2**: No. 1, 107-124(Sep 1979).

By pyrolytic decomposition of silane in the presence of dopant gases, a set of amorphous silicon films was prepared that contains various concentrations of carbon, nitrogen, boron or germanium. The effect of these dopants on the crystallization process and the optical properties is investigated. Films containing about 18 at. % carbon show the properties most favorable for solar absorbers. The crystallization is retarded to temperatures near 1000° C, and the solar absorptance is greater than that of non-intentionally doped CVD amorphous silicon. From the experimentally determined activation energy of crystallization, the structural lifetime for such absorber films is extrapolated to be in excess of several decades for continuous operation at 700°C. For identical thicknesses of absorber layers, spectrally selective stacks of stabilized amorphous silicon deposited on top of a molybdenum reflector have higher solar absorptance than stacks composed of polycrystalline silicon on a silver reflector, amorphous silicon on molybdenum having been tested at temperatures in excess of 500°C.

25377 (DOE/R5/10123—1) Upland Hills Ecological Awareness Center solar air-heating system: control, monitoring, and documentation grant. Final report. (Upland Hills Ecological Awareness Center, Oxford, MI (USA)). [nd]. Contract FG02-79R510123. 44p. NTIS, PC A03/MF A01. Order Number DE81023276.

The completion of the solar and wind systems at the Awareness Center is described. The Center has been under construction for two years, being built to a large extent with volunteer labor. Problems occurred due to the fact that the wind electric system was a rebuilt plant built in 1940 and designed to put out 32 volt dc current. The wind electric system is now providing power for the building as well as electricity to operate the solar heating system and the microcomputer that monitors the systems operation. The solar air heating system is now complete. All components of the system have been installed and are now functional. This 500 square ft site built system is made completely out of locally available construction materials. The collector is coupled with a rock heat storage bin that stores the solar heat for later use in the building. One of its unique features is its integration with a wood furnace. Wood heat can be stored in the storage as well, allowing the building to be left for longer periods of time in periods of cloudy weather.

1410 Solar Collectors And Concentrators

REFER ALSO TO CITATION(S) 25246, 25306, 25961

25378 (CONF-790203—, pp 13p, Paper 2) **Overview of solar system design and application principles.** Dugan, V.L. (Sandia Labs., Albuquerque, NM). 1979. NTIS (US Sales Only), PC A25/MF A01.

From Solar energy symposium; Tokyo, Japan (5 Feb 1979).

Solar thermal energy conversion systems represent a method of reducing dependency on stored energy reserves; this is done at the expense of an increased dependency on materials and land resources. This paper reviews the various technologies being investigated to convert solar radiation into thermal energy and presents

general guidelines which should be followed in designing and applying cost-effective solar conversion systems. This information is expanded upon and illustrated by a comparison of performance results for a range of solar thermal technologies and by one solar irrigation application in the United States.

25379 **(CONF-800804—39) Continuous-System-Modeling Program III: simulation of a solar collector under stagnation conditions.** Hwang, I.T.; Wang, P.Y.; Chopra, P.S. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 13p. NTIS, PC A02/MF A01. Order Number DE81023115.

From ASME century 2 emerging technology conference; San Francisco, CA, USA (10 Aug 1980).

The absorber plate of an inactive solar collector can reach very high temperatures (> 230 C). Then, when the relatively cool heat transfer liquid is pumped through the collector, a steep temperature gradient develops that imposes severe thermal stress on the plate. To evaluate plate deformation and thermal stress, it is essential to have a thorough understanding of the relationship between changes in the plate temperature, changes in the fluid temperatures, and changes in the intensity of solar insolation. The temperature responses that were calculated using the IBM Continuous System Modeling Program III (CSMP III) are presented.

25380 **(DOE/R5/10106—3) Longterm solar heat storage in an underground water cistern retrofitted with thermal insulation. Final technical report, May 15, 1979-March 31, 1981.** Borst, W.L. (Southern Illinois Univ., Carbondale (USA)). 18 Jun 1981. Contract FG02-79R510106. 20p. NTIS, PC A02/MF A01. Order Number DE81023939.

In a rural area of Southern Illinois, an existing, large underground water cistern was retrofitted with urethane insulation and waterproofing to determine the feasibility of the longterm storage of solar heat and environmental coolness. The main objective of the project was to measure the thermal characteristics of the storage, in particular heat storage times and interactions between storage and surrounding soil. A 15.3 m^2 solar collector was site-built to provide the desired heat for storage. The heat was transported in a closed loop to a parallel-tube heat exchanger, which was positioned vertically in the cistern. The experimental approach and results obtained for a longterm energy storage system are described. (MCW)

25381 **Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space.** Azusa, CA; Society for the Advancement of Material and Process Engineering (1981). 893p. (CONF-810408—).

From SAMPE symposium/exhibition; Los Angeles, CA, USA (28 Apr 1981).

The 26th national SAMPE symposium and exhibition was held at the Hyatt at Los Angeles Airport, Los Angeles, California, April 28-30, 1981. Five papers from Volume 26 have been entered individually into EDB and ERA; one had been entered previously from another source. (LTN)

25382 **(SAND—80-2867C) LINSOL: a model for predicting the optical performance of parabolic trough solar thermal systems.** Dellin, T.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810812—3). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A detailed model has been developed to predict the optical performance of parabolic trough solar energy systems. The model is one to two orders of magnitude faster than previous, less complete calculations and makes tractable investigation of a wide range of design and application alternatives for trough systems. Representative results are presented that show the dependence of the trough optical performance on field orientation and site latitude.

25383 **Reflectance modification through controlled surface texturing by sputter etching.** Henager, C.H. Jr. (Pacific Northwest Labs., Richland, WA). Contract AC06-76RLO-1830. *Solar Energy Materials ;* **4**: No. 4, 403-411(Apr 1981).

Triode co-sputter etching of copper in the presence of stainless steel was used to produce textured surfaces on copper disks. The texture consisted of rod-like and ridge-like protrusions. The protrusion spacing and the reflectance cut-off wavelength of the textured disks were shown to be controlled by the temperature of the copper surface during sputtering. The reflectance cut-off wavelength ranged from 500 nm to 12 μm and was shown to be a function of the protrusion spacing. One of the textured surfaces exhibited the characteristics of a moderately good solar selective absorber ($\alpha/\epsilon = 7$) with a solar absorptance $\alpha = 0.66$ and a 300 K thermal emittance $\epsilon = 0.093$. This technique offers the possibility of tailoring surface texture to meet a variety of needs.

25384 **Microstructural and mechanical property evaluation of zinc oxide coated solar collectors.** Homhual, C.; Inal, O.T.; Murr, L.E.; Torma, A.E.; Guendiler, I. (New Mexico Inst. of Mining and Tech., Socorro). Contract ER-78-04-4226. *Solar Energy Materials ;* **4**: No. 3, 309-332(Mar 1981).

Black zinc oxide surfaces produced in an alkaline bath on leaf zinc, electroplated zinc on mild steel and hot-dip zinc coated mild steel substrates show high (6 to 9) selectivity (α/sub s//ϵ/sub 100°C/) values for solar collection applications. These overgrowths are seen to maintain their physical integrity as well as optical properties (α/sub s/ > 0.95) following exposure to 250°C (2 h) in air, possess high strength of attachment to their substrates (> 200 kg/cm^2) and are quite ductile (170° bend previous to fracture) and maintain a high strength of attachment (> 100 kg/cm^2) and ductility (121° bend previous to fracture) following exposure to elevated temperatures of up to 250°C (2 h) in air. Structural analyses of the overgrowths show them to consist of oxide particles within which the elemental component of the oxide is seen to be distributed in the unassociated form. The plating parameters utilized in the deposition of the coatings are seen to alter the quantity and distribution of the elemental component and effect optical properties of these surfaces.

25385 **Microstructural and mechanical property evaluation of black-chrome coated solar collectors. II.** Inal, O.T.; Valayapetre, M.; Murr, L.E.; Torma, A.E. (New Mexico Inst. of Mining and Tech., Socorro). Contract ER-78-04-4266. *Solar Energy Materials ;* **4**: No. 3, 333-358(Mar 1981).

Plating parameters for black-chrome overgrowth deposition were optimized with respect to selectivity (α/sub s//ϵ/sub 100°C/) utilizing simplex evolutionary operation procedures (EVOP) in sixteen sets of experiments. Overgrowths produced with optimized parameters were then evaluated for optical, structural, thermal stability and mechanical properties. It is observed that the coatings produced possess consistently high selectivity values (> 400°C in air and > 500°C in neutral atmosphere), are well attached to their substrates (> 340 kg/cm^2), and are quite ductile (bent to 132° prior to fracture) and remain so following exposure to 500°C (2 h) in air (84° bend prior to fracture). Structural analyses of black chrome coatings show them to consist of oxide particles (Cr_2O_3) within which elemental chromium is seen to be distributed in the unassociated (elemental) form. The plating parameters utilized in deposition of the coatings are seen to alter the quantity and distribution of the elemental component and thus effect the resulting optical properties of these surfaces. Finally, the composite particles, of unassociated metal in an amorphous metal oxide, are seen to be of various sizes but the distribution of these particles are seen to be constant throughout the overgrowth with only an observed increase in the metal content as the overgrowth/substrate interface is reached. The best optical properties occur in coatings with a chromium metal gradient, with chromium content decreasing with distance from the substrate.

25386 **Low-cost, efficient and durable low-temperature solar collector.** O'Donnell, T.P. (Solar Materials, Inc., Altadena, CA). pp 101-107 of Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space. Azusa, CA; Society for the Advancement of Material and Process Engineering (1981).

From SAMPE symposium/exhibition; Los Angeles, CA, USA (28 Apr 1981).

A relatively new synthetic elastomer material for low-temperature solar thermal applications is described. The cost nature, efficiency and durability of this material is high-lighted. This materi-

al, specially formulated ethylene-propylene-diene-monomer (EPDM), is used in a patented solar collector design (SolaRoll). Cost/application experience of Solar Materials, Inc. with this product is discussed.

25387 **Frequency response analysis of fluid control systems for parabolic-trough solar collectors.** Schindwolf, R. (Sandia Lab, Albuquerque, NM). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-15, vp(Nov 1980).

Previous studies of solar-collector fluid-control systems have used computer simulations of collector and piping dynamics to evaluate stability and response characteristics. This paper derives a linearized steady-state frequency response for parabolic-trough collectors and for connecting piping that can be used in standard gain-phase analyses to evaluate system stability and closed-loop frequency response. 6 refs.

25388 **Spectral selectivity of conducting micromeshes.** Pramanik, D.; Sievers, A.J.; Silsbee, R.H. (Cornell Univ., Ithaca, NY). EG-77-S-03-1456. *Solar Energy Materials ;* **2**: No. 1, 81-91(Sep 1979).

The intrinsic absorption produced by the texture and finite conductivity of thin micromeshes is shown to severely limit their potential as a new class of heat mirrors. For semiconducting meshes it is shown that a 90% transmissivity in the solar spectral region is not compatible with a 90% reflectivity in the thermal re-radiation region while for metallic meshes only Al and Mg with submicron wire diameters ($\sim$ 0.1 μm) show a potential improvement in selectivity over that obtained with thin metallic films.

1420 Heat Storage

REFER ALSO TO CITATION(S) 25298, 25308, 25311, 25374, 25580, 26421

25389 **(BNL—51230) Storage in residential solar total-energy systems.** Leigh, R.W. (Brookhaven National Lab., Upton, NY (USA)). Dec 1980. Contract AC02-76CH00016. 85p. NTIS, PC A05/MF A01. Order Number DE81025148.

The potential role is examined of energy storage devices in solar total energy systems operating in a stand-alone mode. High temperature thermal storage is examined in the context of systems employing parabolic trough collectors and Rankine cycle conversion while batteries are evaluated in systems based on parabolic dish concentrators with Stirling cycle conversion or on nonconcentrating photovoltaic systems. In all three systems, storage was found to be advantageous in cases involving high future fuel prices and collectors meeting current cost goals, while storage was not found to be viable at fuel prices remaining near current levels and collector costs exceeding current expectations by substantial margins. Factors making storage more or less desirable are discussed. Throughout, analyses based on minimum cost (optimal) systems are employed.

25390 **(DOE/CS/34697—T1) Series-parallel solar-augmented rock-bed heat pump. Convolution model of rock bed.** Sowell, E.F.; Curry, R.L.; Anderson, S. (California State Univ., Fullerton (USA)). 31 Dec 1979. Contract AS02-78CS34697. 76p. (COO—4697-3). NTIS, PC A05/MF A01. Order Number DE81023001.

A method is presented whereby a packed-bed thermal storage unit is dynamically modeled for bi-directional flow and arbitrary input flow stream temperature variations. The method is based on the principle of calculating the output temperature as the sum of earlier input temperatures, each multiplied by a predetermined response factor, i.e. discrete convolution. A computer implementation of the scheme, in the form of a subroutine for a widely used solar simulation program (TRNSYS) is described and numerical results compared with other models. Also, a method for efficient computation of the required response factors is described; this solution is for a triangular input pulse, previously unreported, although the solution method is also applicable for other input functions. This solution requires a single integration of a known function which is easily carried out numerically to the required precision.

25391 **Three possible alternate energy schemes consistent with the geologic environment of the Snake River Plain.** Niccum, M. (Woodward-Clyde Consultants, San Francisco, CA); Birkhan, P.; Danielson, W.F. pp 243-244 of Eighteenth annual symposium on engineering geology and soils engineering. Boise, ID; Boise State University (1980).

From 18. annual symposium on engineering geology and soils engineering; Boise, ID, USA (2 Apr 1980).

Three possible alternative energy sources using the geologic environment of the Snake River Plain include: geothermal energy, pumped storage and storage of solar or waste heat. Any of the three methods will probably become economically feasible within the next 10 years if the world price of oil continues to rise. Temperature profile studies indicate potential geothermal resources below the surface of the plain; however, wildcat geothermal wells have had little success in tapping this potential resource, except at the margin of the plain. Based on past geologic and geophysical studies, a prediction can be made concerning faults and other geologic structures that probably exist below the basalt. These structures may provide a geothermal resource if intersected by a well. Existing flood-water impounding facilities indicate that surface water can be stored in rather large volumes on the Snake River Plain. Data from water production well tests indicate water can be rapidly extracted from or recharged into the basalt aquifer. Existing data were scaled up to consider the feasibility of a small, 6 MW pumped storage installation for an existing facility having rather unique power cycle needs. The preliminary study indicated the project would be feasible with storage-utilization cycles ranging from the normal daily pumped storage cycles to 10-week cycles. Large natural caves in the basalt may be sealed and used for storing heat energy. The source may be waste heat from industrial processes or it could come from solar collectors. This application would probably be limited to space heating or other low-temperature energy uses (50 to 100°C).

15 GEOTHERMAL ENERGY

1501 Resource Status And Assessment

REFER ALSO TO CITATION(S) 25391, 26421

1503 Geothermal Exploration And Exploration Technology

REFER ALSO TO CITATION(S) 26404

1504 Legal And Institutional Aspects

25392 **(DOE/ID/12014—T1) Montana Geothermal Handbook: a guide to agencies, regulations, permits and financial aids for geothermal development.** Perlmutter, S.; Birkby, J. (Montana Dept. of Natural Resources and Conservation, Helena (USA)). Fal 1980. Contract FC07-79ID12014. 52p. NTIS, PC A04/MF A01. Order Number DE81024315.

The handbook is divided into three parts: a list of the permits required for various thermal projects, and an estimate of time needed to obtain them; a brief discussion of the statutes and regulations referred to; (This information was gathered in a survey of state and federal regulations, as well as in conversations with numerous state and federal officials); and a description of the state and federal grant and loan funding available to a prospective geothermal developer. The names and addresses of the relevant state and federal agencies and legal citations are listed in appendices.

1505 Economic And Financial Aspects

25393 **(DOE/ET/27242—T1) Geothermal well-field and power-plant investment-decision analysis.** Cassel, T.A.V.; Amundsen, C.B.; Edelstein, R.H.; Blair, P.D. (Technecon Analytic Research, Inc., Philadelphia, PA (USA)). 31 May 1981. Contract AC02-79ET27242. 168p. NTIS, PC A08/MF A01.

Investment decisions pertaining to hydrothermal well fields and electric power plants are analyzed. Geothermal investment decision models were developed which, when coupled to a site-specific stochastic cash flow model, estimate the conditional probability of a positive decision to invest in the development of geothermal resource areas. Quantitative decision models have been developed for each major category of investor currently involved in the hydrothermal projects. These categories include: large, diversified energy resource corporations; independently operating resource firms; investor-owned electric utilities; municipal electric utilities; state-run resource agencies; and private third-party power plant investors. The geothermal cash flow, the investment decision analysis, and an example of model application for assessing the likely development of geothermal resource areas are described. The sensitivity of this investment behavior to federal incentives and research goals is also analyzed and discussed.

1506 Environmental Aspects And Waste Disposal

25394 **(DOE/ET/27203—1) Geothermal hydrogen sulfide removal.** Urban, P. (UOP, Inc., Des Plaines, IL (USA)). Apr 1981. Contract AC03-79ET27203. 56p. NTIS, PC A04/MF A01. Order Number DE81023938.

UOP Sulfox technology successfully removed 500 ppM hydrogen sulfide from simulated mixed phase geothermal waters. The Sulfox process involves air oxidation of hydrogen sulfide using a fixed catalyst bed. The catalyst activity remained stable throughout the life of the program. The product stream composition was selected by controlling pH; low pH favored elemental sulfur, while high pH favored water soluble sulfate and thiosulfate. Operation with liquid water present assured full catalytic activity. Dissolved salts reduced catalyst activity somewhat. Application of Sulfox technology to geothermal waters resulted in a straightforward process. There were no requirements for auxiliary processes such as a chemical plant. Application of the process to various types of geothermal waters is discussed and plans for a field test pilot plant and a schedule for commercialization are outlined.

25395 **(PB—81-111114) Methodology to evaluate the potential for ground water contamination from geothermal fluid releases. Final report.** Summers, K.; Gherini, S.; Chen, C. (Tetra Tech, Inc., Lafayette, CA (USA)). Aug 1980. Contract EPA-68-03-2671. 178p. NTIS, PC A09/MF A01.

This report provides analytical methods and graphical techniques to predict potential ground water contamination from geothermal energy development. Overflows and leaks from ponds, pipe leaks, well blowouts, leaks from well casing, and migration from injection zones can be handled by the methodology. General characteristics of geothermal systems and fluids and probable modes of release are included in the report to provide typical data.

1508 Geothermal Power Plants

REFER ALSO TO CITATION(S) 25658

25396 **(ORNL/TM—7718) Water-related constraints to the development of geothermal electric generating stations.** Robertson, R.C.; Shepherd, A.D.; Rosemarin, C.S.; Mayfield, M.W. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 160p. NTIS, PC A08/MF A01. Order Number DE81025138.

The water-related constraints, which may be among the most complex and variable of the issues facing commercialization of geothermal energy, are discussed under three headings: (1) water requirements of geothermal power stations, (2) resource characteristics of the most promising hydrothermal areas and regional and local water supply situations, and (3) legal issues confronting potential users of water at geothermal power plants in the states in which the resource areas are located. A total of 25 geothermal resource areas in California, New Mexico, Oregon, Idaho, Utah, Hawaii, and Alaska were studied. Each had a hydrothermal resource temperature in excess of 150°C (300°F) and an estimated 30-year potential of greater than 100-MW(e) capacity.

25397 **Multi-stage flash degaser.** Rapier, P.M. (to Dept. of Energy). US Patent Application 163,369. 26 Jun 1980. 23p.

A multi-stage flash degaser is incorporated in an energy conversion system having a direct-contact, binary-fluid heat exchanger to remove essentially all of the noncondensable gases from geothermal brine ahead of the direct-contact binary-fluid heat exchanger in order that the heat exchanger and a turbine and condenser of the system can operate at optimal efficiency.

1509 Geothermal Engineering

25398 **Method for inhibiting silica precipitation and scaling in geothermal flow systems.** Harrar, J.E.; Lorensen, L.E.; Locke, F.E. (to Dept. of Energy). US Patent Application 159,313. 13 Jun 1980. 16p.

A method for inhibiting silica scaling and precipitation in geothermal flow systems by on-line injection of low concentrations of cationic nitrogen-containing compounds, particularly polymeric imines, polymeric amines, and quaternary ammonium compounds is described.

25399 **(LA-UR—81-852) Development of man-made geothermal reservoirs.** Pettitt, R.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810808—4). NTIS, PC A02/MF A01.

From Energy in the man-built environment: the next decade specialty conference; Vail, CO, USA (3 Aug 1981).

Hot-dry-rock (HDR) systems and their resource potential are described. The HDR field program at the Fenton Hill site is discussed. (MHR)

25400 **(LA-UR—81-1265) Hot dry rock geothermal energy development program. A progress report.** Franke, P.R. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 17p. (CONF-810812—11). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Since the enlargement of the research reservoir was effected, two extended heat-extraction runs have been made. Run Segment 4 was conducted during October and November of 1979 for a total operating duration of 551 hours. The thermal drawdown data indicated that the effective heat-transfer area had been increased by not less than a factor of 6. The second test, Run Segment 5, began near the end of February 1980, and concluded on 16 December 1980. The enlargement of the reservoir is confirmed by the very gradual thermal drawdown, and the effective heat-transfer area of the research reservoir is now believed to be of the order of 50,000 m^2. To date, over 20 million kilowatt-hours of thermal energy have been extracted from the Fenton Hill research reservoir at Power Levels ranging from 2.3 to 5.0 MW/sub t/. Recently, a small on-line electric generation experiment was added as part of Run Segment 5. In the larger engineering system, the injection well (EE-2) is now complete to a depth of 4450 m with a bottom-hole temperature of 320 C and the production well (EE-3) is being drilled.

25401 (LBL—12076, pp 110-119) **Thermal effects in welltests of fractured reservoirs.** Bodvarsson, G.S.; Tsang, C.F. (Lawrence Berkeley Lab., CA). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

In this paper, a numerical simulator is used to study two basic problems. The first problem involves the analysis of injection tests of homogeneous porous media geothermal reservoirs. Due to the dependence of viscosity and density of water on temperature, the pressure response at injection wells will be considerably different from the pressure transient resulting from a conventional (isothermal) pumping test. The second part of this paper deals with the problem of wastewater injection into a fractured geothermal reservoir. It is commonly believed that when fractures are present, the injected cold water will rapidly advance along the fractures to wells in the production region. If true, this may cause a drastic reduction in the amount of energy which could be extracted from the geothermal resource. A simple reservoir model with a few major fractures was used to study the movement of the thermal front in

the fracture relative to its movement in the porous media during injection.

25402 (LBL—12076, pp 130-134) **Drawdown and build-up type curve for interference testing.** Ramey, H.J. Jr. (Stanford Univ., CA). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

Interference testing is a powerful method for in situ measurement of transmissivity, storativity, and quantitative identification of anisotropy and system boundaries. The log-log type-curve matching procedure can be used for analysis of interference data taken during production or drawdown. Once production is terminated, observation well pressures return toward the initial pressure. This recovery, or pressure build-up, has been interpreted by differencing the extrapolated drawdown and measured build-up. This procedure extracts the injection well which causes the build-up. A new type curve for both the drawdown and build-up portion of the test has been prepared. Application of the new type curve shows that the older differencing procedure may obscure detection of system boundaries. The principal of the build-up type curve may be extended to other flow problems. 5 figures.

25403 (SAND—80-7057) **Evaluation of equipment and methods to map lost circulation zones in geothermal wells.** McDonald, W.J.; Leon, P.A.; Pittard, G. (Sandia National Labs., Albuquerque, NM (USA); Maurer Engineering, Inc., Houston, TX (USA)). May 1981. Contract AC04-76DP00789. 208p. NTIS, PC A10/MF A01.

A study and evaluation of methods to locate, characterize, and quantify lost circulation zones are described. Twenty-five methods of mapping and quantifying lost circulation zones were evaluated, including electrical, acoustical, mechanical, radioactive, and optical systems. Each tool studied is described. The structured, numerical evaluation plan, used as the basis for comparing the 25 tools, and the resulting ranking among the tools is presented.

25404 (SAND—80-7154/1) **Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1.** Smith, D.M. (Sandia National Labs., Albuquerque, NM (USA); Scientific Simulation, Inc., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 137p. NTIS, PC A07/MF A01. Order Number DE81026039.

IOSYM is an extension of the GASP IV simulation language. It permits systems which are sequences of continuous processes to be modeled graphically. Normally the system can be described by data input only. The language permits stochastic sequencing and termination criteria for processes and allows crossing conditions for ending operations that are more general than GASP IV. Extensive capability exists for conditional branching and logical modification of the network. IOSYM has been used to model the cost of geothermal drilling where the various costly processes of drilling are represented by IOSYM operations. The language is much more general, however, since it retains more of GASP IV's discrete event capabilities and permits easy modeling of continuous processes.

25405 (SAND—80-7154/2) **Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description.** Smith, D.M. (Sandia National Labs., Albuquerque, NM (USA); Scientific Simulation, Inc., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 504p. NTIS, PC A22/MF A01. Order Number DE81026040.

IOSYM is an extension of the GASP IV simulation language. It permits systems which are sequences of continuous processes to be modeled graphically. Normally the system can be described by data input only. The language permits stochastic sequencing and termination criteria for processes and allows crossing conditions for ending operations that are more general than GASP IV. Extensive capability exists for conditional branching and logical modification of the network. IOSYM has been used to model the cost of geothermal drilling where the various costly processes of drilling are represented by IOSYM operations. The language is much more general however; it retains more of GASP IV's discrete event capabilities and permits easy modeling of continuous processes.

1510 Direct Energy Utilization

25406 (DOE/ID/12051—T1) **Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw.** Murphy, V.G.; Linden, J.C.; Moreira, A.R.; Lenz, T.G. (Colorado State Univ., Fort Collins (USA). Dept. of Agricultural and Chemical Engineering). Jun 1981. Contract AS07-79ID12051. 61p. NTIS, PC A04/MF A01. Order Number DE81023338.

The effects of variations in autohydrolysis conditions on the production of fermentable sugars from wheat straw are investigated. Both the direct production of sugar from the autohydrolysis of hemicellulose and the subsequent yield from the enzymatic hydrolysis of cellulose are considered. The principal parameters studied were time, temperature, and water/fiber weight ratio; however, the effects of adding minor amounts of phenol and aluminum sulfate to the autohydrolysis charge were also investigated. A brief study was made of the effects of two major parameters, substrate concentration and enzyme/substrate ratio, on the sugar yield from enzymatic hydrolysis of optimally pretreated straw. The efficiency with which these sugars could be fermented to ethanol was studied. In most cases experiments were carried out using distilled water; however, the effects of direct use of geothermal water were determined for each of the major steps in the process. An appendix to the body of the report describes the results of a preliminary economic evaluation of a plant designed to produce 25 x 10^6 gallons of ethanol per year from wheat straw using the best process conditions determined in the above work. Also appended are the results from a preliminary investigation of the applicability of autohydrolysis technology to the production of fermentable sugars from corn stover.

25407 (DOE/SF/01795—T2) **Geothermal policy project. Quarterly report, November 1, 1979-January 31, 1980.** Sacarto, D.M. (National Conference of State Legislatures, Denver, CO (USA)). Feb 1980. Contract FG03-78SF01795. 58p. (SAN—1795-9). NTIS, PC A04/MF A01.

Solicitation letters for geothermal and ground water heat-pump energy were sent to ten new states, and initial contact was made in two other states, Arizona and Nevada, concerning 1980 project activities. Follow-up contacts were made with several existing project states, and state meetings and workshops were held in five project states. The Preliminary Geothermal Profile for the state of Nevada as well as other project materials were prepared.

25408 (DOE/SF/11442—T1) **Feasibility of geothermal heat use in the San Bernardino Municipal Wastewater Treatment Plant. Final report, September 1980-June 1981.** Racine, W.C.; Larson, T.C.; Stewart, C.A.; Wessel, H.B. (San Bernardino Municipal Water Dept., CA (USA)). 1981. Contract FG03-80SF11442. 170p. NTIS, PC A08/MF A01. Order Number DE81025157.

The results of the feasibility study for utilizing low temperature geothermal heat in the City of San Bernardino Wastewater Treatment Plant are summarized. The study is presented in terms of preliminary engineering design, economic analysis, institutional issues, environmental impacts, resource development, and system implementation.

25409 (GT—27041-4) **Kelley Hot Spring Geothermal Project: Kelly Hot Spring Agricultural Center conceptual design.** Longyear, A.B. (ed.). (Geothermal Power Corp., Novato, CA (USA)). Jun 1980. Contract AC03-79ET27041. 85p. NTIS, PC A05/MF A01. Order Number DE81024362.

The proposed core activity in the Kelly Hot Spring Agricultural Center is a nominal 1200 sow swine raising complex. The swine raising is to be a totally confined operation for producing premium pork in controlled environment facilities that utilize geothermal energy. The complex will include a feedmill for producing the various feed formulae required for the animals from breeding through gestation, farrowing, nursery, growing and finishing. The market animals are shipped live by truck to slaughter in Modesto,

California. A complete waste management facility will include manure collection from all raising areas, transport via a water flush sysem to methane (biogas) generators, manure separation, settling ponds and disposition of the surplus agricultural quality water. The design is based upon the best commercial practices in confined swine raising in the US today. The most unique feature of the facility is the utilization of geothermal hot water for space heating and process energy throughout the complex.

16 TIDAL POWER

1608 Wave Energy Converters

REFER ALSO TO CITATION(S) 25321

25410 (SERI/TP—634-1215) Fabrication, testing, and modeling plans for a 125-kW counter-rotating-turbine wave energy converter. Miles, J.; Penney, T. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1981. Contract AC02-77CH00178. 12p. (CONF-810622—4). NTIS, PC A02/MF A01. Order Number DE81023946.

From 8. ocean energy conference; Washington, DC, USA (7 Jun 1981).

An air turbine accepting bi-directional flow and featuring counter-rotating turbine wheels is described. The turbine is for use with an oscillating water column and an air chamber to form a wave energy converter. Plans are presented for testing the turbine in a steady-state manner so as to obtain output torque and mass flow as functions of operational parameters. Additional tests will evaluate the rotary inertia of the turbine and generator, and determine the torque requirements of the generator. Concurrent modelling studies are described which will lead to the design of an optimized airchamber.

17 WIND ENERGY

REFER ALSO TO CITATION(S) 25216

25411 (SERI/PR—635-1239) Wind energy systems quarterly review, January 1-March 31, 1981. (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH00178. 190p. NTIS, PC A10/MF A01.

Summaries are presented of research programs concerning wind turbine market characterization; economics of WECS owned by the end user; WECS-utility interface; selected utilities value analaysis; WECS application in nongenerating utilities; WECS utility guide; small wind turbine production evaluation and cost analysis; WECS storage assessment and options; WECS legal issues; environmental assessment of wind systems; television interference and WECS; WECS noise studies; WECS incentives; advanced and innovative wind energy concepts; and engineering and cost analyses of AIWEC.

1701 Availability (climatology)

REFER ALSO TO CITATION(S) 25420

25412 (PNL—3451) Techniques for assessing the wind energy resource in the East Central region. Brode, R.; Stoner, R. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Sep 1980. Contract AC06-76RL01830. 128p. NTIS, PC A07/MF A07. Order Number DE81025105.

A series of regional wind energy resource atlases has been prepared as part of the Wind Characteristics Program Element of the Federal Wind Energy Program. This report describes the methods specifically used to produce the wind energy resource atlas of the East Central region. In preparing the assessment, screening procedures were developed to identify stations with the most useful data and to eliminate stations that would not significantly contribute information on the distribution of the wind resource. A total of 488 stations were screened and 228 stations were retained for analysis. Unsummarized data were used only when no summarized or digitized data were available. Seasonal and annual values of wind power density were calculated from the screened wind data set. In a single number, wind power density incorporates the combined effect of the distribution of wind speeds and the dependence of the power density on air density and on the cube of the wind speed. A power law was used to adjust wind power estimates to reference levels of 10 m and 50 m.

25413 (PNL—3452) Techniques for assessing the wind energy resource in the Northeast region. Pickering, K.E.; Vilardo, J.M.; Schakenbach, J.T. (Geomet Technologies, Inc., Gaithersburg, MD (USA)). Jun 1980. Contract AC06-76RL01830. 191p. NTIS, PC A09/MF A01. Order Number DE81025104.

Techniques developed by Pacific Northwest Laboratory (PNL) along with those developed by GEOMET to assess the wind energy resource in the Northeast are described. In the assessment, wind data locations were identified and the data obtained were screened to determine their usefulness. Summarized data were processed and wind power values were estimated for all data locations. Upper air data were used to estimate wind power on mountaintops and ridge crests. Additional information on the wind resource was gained through a survey of wind-deformed vegetation. Maps of annual and seasonal wind power classes were constructed from the computed wind power values along with the aid of landform and shaded relief maps. Various topographic and landform features could be associated with high or low wind power.

25414 (PNL—3667) Techniques for assessing the wind energy resource in the North Central region. Freeman, D.L. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Mar 1981. Contract AC06-76RL01830. 84p. NTIS, PC A05/MF A01. Order Number DE81025102.

The US Department of Energy has sponsored the development of regional wind energy resource atlases for twelve regions of the United States. The North Central Region, which consists of North Dakota, South Dakota, Nebraska, Minnesota, and Iowa, was one of the regions for which an atlas was assembled. This report is a description of observational and analytical techniques used in the development of the North Central region's wind energy resource atlas.

25415 (PNL—3668) Techniques for assessing the wind energy resource in the Great Lakes region. Paton, D.L.; Bass, A.; Smith, D.G. (Environmental Research and Technology, Inc., Concord, MA (USA)). Feb 1981. Contract AC06-76RL01830. 132p. NTIS, PC A07/MF A01. Order Number DE81025103.

The atlas of the wind resource in the Great Lakes region is one of 12 regional assessments sponsored by the Department of Energy. This report is a supplement to the wind energy resource atlas for the Great Lakes region. It includes a detailed discussion of the methodologies and data employed to complete the atlas. A summary of the regional annual average wind power, highlighting the major wind resource areas, appears at the end of the report.

25416 (PNL—3669) Techniques for assessing the wind energy resource in the Southeast region. Zabransky, J.; Vilardo, J.M.; Schakenbach, J.T. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Oct 1980. Contract AC06-76RL01830. 138p. NTIS, PC A07/MF A01. Order Number DE81025100.

Techniques developed by Pacific Northwest Laboratory (PNL) along with those developed by GEOMET to assess the wind energy resource in the Southeast are described. In the assessment, wind data locations were identified and the data obtained were screened to determine their usefulness. Summarized data were processed and wind power values were estimated for all data locations. Upper air data were used to estimate wind power on mountaintops and ridge crests. Maps of annual and seasonal wind power classes were constructed from the computed wind power values along with the aid of landform and shaded relief maps. Various topographic and landform features could be associated with high or low wind power.

25417 **(PNL—3671) Techniques for assessing the wind energy resource in the Southern Rocky Mountain region.** Freeman, D.L.; Anderson, S.R. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Apr 1981. Contract AC06-76RL01830. 97p. NTIS, PC A05/MF A01. Order Number DE81025099.

The US Department of Energy has sponsored the development of regional wind energy resource atlases for twelve regions of the United States. The Southern Rocky Mountain region, which consists of Arizona, Colorado, New Mexico, and Utah, was one of the regions for which an atlas was assembled. This report is a description of observational and analytical techniques used in the development of the Southern Rocky Mountain region's wind energy resource atlas.

25418 **(PNL—3672) Techniques for assessing the wind energy resource in the Southwest region.** Simon, R.L.; Norman, G.T. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Dec 1980. Contract AC06-76RL01830. 43p. NTIS, PC A03/MF A01. Order Number DE81025098.

This report has been prepared as a technical supplement to the Southwest Regional Wind Energy Resource Atlas (Simon & Norman, 1980). Its purpose is to discuss the methodology used to generate the resource assessment and the results obtained in a manner useful and instructive to other professionals in the wind resource assessment field. It is designed to be used in conjunction with the Atas and the maps and tables contained within it.

25419 **(PNL—3673) Techniques for assessing the wind energy resource in Hawaii and Pacific Islands region.** Schroeder, T.A.; Hori, A.M. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Aug 1980. Contract AC06-76RL01830. 42p. NTIS, PC A03/MF A01. Order Number DE81025101.

This report explains the procedures utilized in preparing the Wind Energy Resource Atlas: Hawaii and Pacific Islands Region and contrasts these methods with those used in the other regional assessments. Techniques generally paralleled those of the northwest wind resource assessment. Quality of data bases differed drastically between Hawaii and the Pacific Islands. For example, research data sets constituted a primary data source for Hawaii, but such sets were nonexistent for the Pacific Islands. Forest Service data had minor impact in Hawaii, none in the Pacific Islands. Many Pacific Island anemometers are poorly exposed since limited open spaces exist on small atolls.

1703 Regulations

REFER ALSO TO CITATION(S) 25231

1706 Wind Energy Engineering

REFER ALSO TO CITATION(S) 25368, 25377

25420 **(DOE/ET/23007—80/1) Planetary boundary-layer wind model evaluation at a mid-Atlantic coastal site.** Tieleman, H.W. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Engineering Science and Mechanics). Oct 1980. Contract AC06-79ET23007. 201p. NTIS, PC A10/MF A01. Order Number DE81024093.

Detailed measurements of the mean flow and turbulence have been made with the use of a micrometeorological facility consisting of an instrumented 76-m tall tower located within a 100-m distance from the Atlantic Ocean at Wallops Island, Virginia. An interpretation of the experimental results demonstrates that under moderately strong wind conditions (hourly mean wind speed between 10 m/s and 20 m/s at a height of 10 m), the popular neutral boundary-layer flow model fails to provide an adequate description of the actual flow. In addition to detailed flow information for all wind directions, averages of the important flow parameters used for design such as vertical distribution of mean velocity, turbulence intensities and turbulence integral scales have been presented for wind-direction sectors with near-uniform upstream terrain. Power spectra of the three velocity components for the prevailing northwesterly and southerly winds are presented and discussed in detail.

25421 **(DOE/NASA/20320—31) Lightning-accommodation systems for wind-turbine-generator safety.** Bankaitis, H. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. Contract AI01-76ET20320. 16p. (NASA-TM—82601; CONF-810721—2). NTIS, PC A02/MF A01.

From 5. international system safety conference; Denver, CO, USA (26 Jul 1981).

Wind turbine generators are being evaluated as alternate sources of electrical energy. The wind turbine safety program identifies the naturally occurring lightning phenomenon as a hazard with the potential to cause loss of program objectives, injure personnel, damage system instrumentation, structure or support equipment and facilities. The Lewis Research Center is responsible for the development of large wind turbines in the 100 kW to multimegawatt size range. In support of this program, several candidate methods of lightning accommodation for each blade have been designed, analyzed, and tested by submitting sample blade sections to simulated lightning. At the present time, lightning accommodation systems for composite blades are being individually developed. Their effectiveness is evaluated by submitting the systems to simulated lightning strikes. The test data are analyzed and system designs are reviewed on the basis of the analysis. This activity is directed at defining design and procedural constraints, requirements for safety devices and warning methods, special procedures, protective equipment and personnel training.

25422 **(PB—81-109621) Wind resource of the area surrounding Medicine Bow, Wyoming.** (Water and Power Resources Service, Denver, CO (USA). Engineering and Research Center). Aug 1980. 39p. NTIS, PC A03/MF A01.

Five high-wind sites in the vicinity of Medicine Bow, Wyoming, were instrumented to record wind resource data, with the ultimate goal of installing a large number of WTG's (wind turbine generators), i.e., establishing a windfarm. Integration of windpower and hydroelectric power would be accomplished by tying the windfarm output into an existing hydropower electrical grid. This report presents data collected from February 1, 1978, through October 31, 1979. The data is presented in the form of plots of monthly mean windspeed, duration windspeed exceeded, windspeed frequency, and polar wind roses.

25423 **(PNL—3622) Assessing the local windfield with instrumentation.** Zambrano, T.G. (Battelle Pacific Northwest Labs., Richland, WA (USA); AeroVironment, Inc., Pasadena, CA (USA)). Oct 1980. Contract AC06-76RL01830. 281p. NTIS, PC A13/MF A01. Order Number DE81025516.

This report concerns the development and testing of a technique for the initial screening and evaluation of potential sites for wind-energy conversion systems (WECS). The methodology was developed through a realistic siting exercise. The siting exercise involved measurements of winds along the surface and winds aloft using a relatively new instrument system, the Tethered Aerodynamic Lifting Anemometer (TALA) kite; notation of ecological factors such as vegetation flagging, soil erosion and site exposure, and verification of an area best suited for wind-energy development by establishing and maintaining a wind monitoring network. The siting exercise was carried out in an approximately 100-square-mile region of the Tehachapi Mountains of Southern California. The results showed that a comprehensive site survey involving field measurements, ecological survey, and wind-monitoring can be an effective tool for preliminary evaluation of WECS sites.

25424 **(PNL—3771) Some aspects of fluctuating vertical wind shears.** Doran, J.C. (Battelle Pacific Northwest Labs., Richland, WA (USA)). May 1981. Contract AC06-76RL01830. 29p. NTIS, PC A03/MF A01. Order Number DE81025114.

Fluctuating vertical shears of wind speed have been measured using an array of towers. The statistical distributions of these shears are compared with formulas proposed by Fichtl (1971, 1972) and good agreement is found. A comparison of Fichtl's formula for the standard deviation of the fluctuating shears with a more empirical one proposed by Ramsdell (1978) shows that the latter is consistent with the former under the proper conditions. The probabil-

ity of occurrence of extreme shears in speed is discussed. Directional shears are not treated. Fluctuating shears two or more times larger than the mean values are shown to be readily obtainable, and their likelihood increases as the mean measuring height increases if ΔZ is held fixed.

25425 (SAND—81-7017) Vortex model of the Darrieus turbine: an analytical and experimental study. Final report. Strickland, J.H.; Smith, T.; Sun, K. (Sandia National Labs., Albuquerque, NM (USA); Oregon State Univ., Corvallis (USA). Dept. of Mechanical Engineering). Jun 1981. Contract AC04-76DP00789. 188p. NTIS, PC A09/MF A01. Order Number DE81026041.

Improvements in a vortex/lifting, line-based Darrieus wind turbine, aerodynamic performance/loads model are described. These improvements include consideration of dynamic stall, pitching circulation, and added mass. Validation of these calculations was done through water tow tank experiments. Certain computer run time reduction schemes for the code are discussed.

25426 (SAND—81-7026) Fixed-wake analysis of the Darrieus rotor. Wilson, R.E.; Walker, S.N. (Sandia National Labs., Albuquerque, NM (USA); Oregon State Univ., Corvallis (USA). Dept. of Mechanical Engineering). Jul 1981. Contract AC04-76DP00789. 86p. NTIS, PC A05/MF A01. Order Number DE81026042.

Development and validation of a Darrieus wind turbine aerodynamic performance prediction model is described. Using a fixed-wake approach, the model combines some of the more desirable features of vortex/lifting line and conservation of momentum/streamtube approaches. The model thus accounts for up- and downwind differences that are predicted by vortex approaches while retaining the short computer run times found with streamtube models. The model treats the effects of stall, curved blades, blade pitch, and blade attachment location. Results agree with those obtained with Sandia National Laboratories' 17-m-diameter Darrieus VAWT.

25427 (SERI/TR—8085-1-T1) Advanced and innovative wind energy concept development: dynamic inducer system. Executive summary. Lissaman, P.B.S.; Zalay, A.D.; Hibbs, B.H. (Solar Energy Research Inst., Golden, CO (USA); AeroVironment, Inc., Pasadena, CA (USA)). May 1981. Contract AC02-77CH00178. 16p. NTIS, PC A02/MF A01.

Innovative concepts are being sought to improve the technical and economic performance of wind energy conversion systems (WECS). One promising technique for improving the cost-effectiveness of WECS is the use of tip vanes. Tip vanes are small airfoils attached approximately at right angles to the rotor tips with their span oriented approximately parallel to the local freestream. In this program, the performance benefits of the dynamic inducer tip vane system have been experimentally demonstrated for the first time. Tow-tests conducted on a three-bladed, 3.6-meter diameter rotor have shown that a dynamic inducer can achieve a power coefficient (based upon power blade swept area) of 0.5, which exceeds that of a plain rotor by about 35%. Wind tunnel tests conducted on a one-third scale model of the dynamic inducer achieved a power coefficient of 0.62 which exceeded that of a plain rotor by about 70%. The dynamic inducer substantially improves the performance of conventional rotors and indications are that higher power coefficients can be achieved through additional aerodynamic optimization. A brief discussion of the analytical program, wind tunnel tests, and field tests is given, followed by conclusions and recommendations.

25428 (SERI/TR—8085-1-T2) Advanced and innovative wind energy energy concept development: dynamic inducer system. Research report. Lissaman, P.B.S.; Zalay, A.D.; Hibbs, B.H. (Solar Energy Research Inst., Golden, CO (USA); AeroVironment, Inc., Pasadena, CA (USA)). May 1981. Contract AC02-77CH00178. 89p. (Q). NTIS, PC A05/MF A01.

The performance benefits of the dynamic inducer tip vane system have been experimentally demonstrated for the first time. Tow-tests conducted on a three-bladed, 3.6-meter diameter rotor have shown that a dynamic inducer can achieve a power coefficient (based upon power blade swept area) of 0.5, which exceeds that of a plain rotor by about 35%. Wind tunnel tests conducted on a one-third scale model of the dynamic inducer achieved a power coefficient of 0.62 which exceeded that of a plain rotor by about 70%. The dynamic inducer substantially improves the performance of conventional rotors and indications are that higher power coefficients can be achieved through additional aerodynamic optimization. It is noted that the wind turbine system used as a baseline unit is the Kedco 1200, a conventional propeller-type wind turbine with power blades designed for optimum performance without tip vane augmentation. In addition, the tip vane utilized a standard conventional NACA airfoil selected on conservative grounds to guarantee acceptable performance. More advanced high life-to-drag airfoil sections are expected to improve the tip vane effectiveness.

25429 Wind assisted deep-well pumping. Clark, R.N. (Dept. of Agriculture, Bushland, TX). *ASAE Publication ;* No. 4-81, 479-483(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

A 37-kW, vertical-axis wind turbine was successfully coupled to an existing irrigation pump by installing a combination gear drive between the pump and electric motor. The system operated as a wind-assisted system because the wind turbine reduced the load on the electric motor and saved energy. To synchronize the two power sources, an overrunning clutch was used in the mechanical drive line. This clutch was essential to the power train because it allowed the wind turbine to operate at its maximum efficiency without causing any loading on the electric motor at low windspeeds. The clutch, combination gear drive, and connecting shafting are all commonly available in irrigated areas. Results indicated that as much as 40% of the pesent energy consumed in irrigation pumping can be generated by wind power. Wind energy systems for irrigation appear best suited for limited irrigation of crops like cotton and sorghum, rather than full irrigation of crops like corn and alfalfa.

25430 Economic analysis of wind energy for irrigation pumping. Lansford, R.R. (New Mexico State Univ., Las Cruces); Supalla, R.J.; Gilley, J.R.; Clark, R.N. *ASAE Publication ;* No. 4-81, 484-488(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

This paper addresses some of the economic questions associated with wind power as an energy source for pumping irrigation water. The principal objective was to determine the maximum amount which irrigators in different situations could afford to invest in a wind turbine system. The results of the analysis can be used by the United States Department of Energy and other research organizations, as well as irrigators. Three types of wind systems were considered at seven different geographic locations, assuming three price scenarios. The three types of wind powered irrigation systems evaluated were: wind assist combustion engines (diesel, natural gas, LPG and gasoline); wind assist electric, with and without sale of surplus electricity; and stand alone reservoir systems.

25431 Simulation model to evaluate the performance of windmill systems. Wysk, R.A.; Choi, B.; Tanchoco, J.M.A. (Virginia Polytechnic Inst. and State Univ., Blacksburg). *ASAE Publication ;* No. 4-81, 489-495(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

This paper presents a simulation model of a wind power generation system. The system described is used to provide power to an apple-cooling storage facility which has both electric and thermal storage facilities. Different windmill, apple storage, and system control configurations are simulated in order to determine the performance for this particular wind power application. The use of this model and methodology for the design of new systems and optimization of existing systems is also discussed.

25432 Improved control strategy for wind-powered refrigerated storage of apples. Baldwin, J.D.C. (Louisiana State Univ., Baton Rouge); Vaughan, D.H. *ASAE Publication ;* No. 4-81, 496-500(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

A refrigerated apple storage facility was constructed at the VPI & SU Horticultural Research Farm in Blacksburg, Virginia and began operation in March 1978. The system included a 10-kW electric wind generator, electrical battery storage, thermal (ice) storage, and auxiliary power. The need for an improved control system for the VPI & SU system was determined from tests on the individual components and in situ performance tests. The results of these tests formed the basis for an improved control strategy to improve the utilization of available wind energy and reduce the need for auxiliary power while maintaining an adequate apple storage environment.

25433 **Torque ripple in a Darrieus, vertical axis wind turbine.** Reuter, R.C. Jr. (Sandia Lab, Albuquerque, NM). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-13, vp(Nov 1980).

Interaction between a steady wind and a rotating, Darrieus, vertical axis wind turbine produces time periodic aerodynamic loads which cause time dependent torque variations, referred to as torque ripple, to occur in the mechanical link between the turbine and the electrical generator. An analytical solution characterizing the phenomenon of torque ripple has been obtained which is based upon a Fourier expansion of the time dependent features of the problem. 9 refs.

25434 **VAWTDYN--a numerical package for the dynamic analysis of vertical axis wind turbines.** Lobitz, D.W.; Sullivan, W.N. (Sandia Lab, Albuquerque, NM). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/Sol-18, vp(Nov 1980).

The dynamic behavior of wind turbines is a major factor governing their overall fatigue life and reliability. This paper describes a package developed for the dynamic analysis of the Darrieus vertical axis wind turbine. The model on which the package is based includes the major rotor elastic degrees of freedom, gyroscopic effects, and structural damping. The equations of motion are discussed and several example solutions are presented. Comparisons are made between model predictions and data from operational rotors. 10 refs.

20 ELECTRIC POWER ENGINEERING

25435 **(DOE/EIA—0095(80)) Inventory of power plants in the United States. 1980 annual.** (Department of Energy, Washington, DC (USA). Energy Information Administration). 18 Jun 1981. 338p. NTIS, PC A15/MF A01. Order Number DE81025339.

Tabulated and graphic data for 1980 are presented on existing and projected US power plants. First, summary information is arranged by primary fuel, existing capacity, number of existing units, projected capacity, and number of projected units. Sections appear for the 50 United States and the District of Columbia, and for individual states listed in alphabetical order. Sections are also provided for summaries by NERC (National Electric Reliability Council) regions, census regions, and federal regions. Second, a comprehensive list of power generating units in the US and District of Columbia is presented with data on existing, projected, cancelled, shut-down, postponed, retired, and standby units. This information is categorized by state, company, plant and unit, in that order. Generating units are described by nameplate capacity, unit type, and primary and alternative fuel source. In addition information is provided on current operating status of units, as well as dates of initial production. Third, data are presented on jointly owned US power plants. The information is sub-divided by state, company, plant and unit. Names of joint utility owners and percentages of ownership are presented. Generating units are also described by nameplate capacity, unit type, primary and alternative fuel use, current operating status and dates of initial production. Finally, data are provided on planned or under construction power plants. The information is sub-divided by state, company, plant name, location, unit number, and current and originally scheduled completion date. In addition data is supplied on nameplate capacity, unit type, and primary fuel to be used. It is also possible to determine whether plant's environmental impact statement has been prepared, drafted, or is in final form. (LCL)

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 24862, 24958, 24958, 24960, 24962, 24963, 25061, 25062, 25062, 25063, 25064, 25065, 25285, 25291, 25468, 25577, 25583, 25617, 25618, 25632, 25825

25436 **(ANL/CEN/FE—80-24) Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980.** Johnson, I.; Lee, S.H.D. (Argonne National Lab., IL (USA)). May 1981. Contract W-31-109-ENG-38. 131p. NTIS, PC A06/MF A01. Order Number DE81024482.

This work supports the program to develop methods for the cleanup of combustion gases from pressurized fluidized-bed coal combustors so that the cleaned gases can be used to power downstream gas turbines. Presented here are the results of studies to develop granular sorbents for removing gaseous alkali metal compounds from these combustion gases in a granular-bed filter. Activated bauxite bed material can be reused after the alkali compound is removed by a water-leaching process. In experiments to study the kinetics of leaching, the effects of adsorbed NaCl loading, leaching temperature, and the leaching water to sorbent ratio on the rate of leaching are reported. Also reported are water retention in bauxite after leaching and the effect of volatile alkalis in makeup activated bauxite on the alkali level in flue gas expanded in the gas turbine.

25437 (ANL/CNSV-TM—60, pp 403-411) **Issues for refuse derived fuels as applied to utility boilers.** Klumb, D.L. (Union Electric Co., St. Louis, MO). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The first use of Refuse Derived Fuel (RDF) as a fuel supplement in a pulverized coal utility boiler began in April 1972. Since that first successful experimental firing there have been similar RDF installations that have demonstrated the technical feasibility of RDF firing and have also demonstrated technical, financial, and political problems. Utilities have clearly demonstrated a willingness to carefully and fairly consider RDF firing in their pulverized coal boilers. Utilities are faced with ever increasing capital and operating costs compounded by uncertain governmental regulatory constraints. RDF may provide some modest utility cost savings and may enhance a utility's image in the community but those responsible for solid waste disposal should not presume that their local electric company is a captive market. This paper is an attempt to outline some of the power plant technical and cost factors that utilities consider when evaluating RDF firing.

25438 **(CONF-801210—27) Energy, capacity, and economic effects of cogeneration interfaced with electric-utility systems.** VaKuiken, J.; Hub, K. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023818.

From 3. Miami international conference on alternative energy sources; Miami Beach, FL, USA (15 Dec 1980).

The potential energy saving, capacity credits, and economic impacts of various arrangements for electrical power supply between utilities and small power cogenerators are discussed. The approach is to use a methodology consistent with those used by utilities in their reliability and generation cost analysis. Emphasis is placed on qualitative observations derived from detailed simulation investigations. Results are discussed that exhibit a wide range of fuel and cost impacts from grid-connected cogeneration. The variations demonstrate the dependency of results on utility system and cogenerator characteristics. Observations summarize, as best as possible, the general trends that occur for alternative combinations of: (1) utility composition; (2) cogenerator design and fuel type; and (3) capacity displacement choices. These are the three characteristic parameters used to describe each case study. Two synthetic utility systems are tested for their fuel and reliability responses to cogeneration. One is representative of systems in the midwest with predominantly coal-fueled capacity (51%). Nuclear (20%) and oil (21%) units make up most of the remaining capacity. The other system is primarily oil-fired capacity (54%) with smaller amounts of

coal (23%) and nuclear (18%) sources. In general, it appears that cogeneration will have a difficult time competing with utility generation.

25439 (DOE/BETC/IC—80/3(Vol.4), pp 8p, Paper 27) **Feasibility of operating medium-speed diesel engines with coal derived liquids.** Wilson, R.P. Jr.; Mendillo, J.V. (Arthur D. Little, Inc., Cambridge, MA). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

The purpose of this feasibility study is to identify the critical problems and side effects associated with firing coal-derived liquids in a class of medium-speed stationary diesel engines that has major application in oil and gas production, electricity generation, industrial power, and nuclear standby power. The emphasis of the program will be on identifying the effect of coal derived liquids on operating characteristics such as ignition delay; injection system operation; BSFC; NO/sub x/, HC, CO, soot and PAH emissions; exhaust temperature; rate of cylinder pressure rise; peak cylinder pressure; and short-term carbon build-up. During the first contract year, (September, 1979-September 1980), the following progress was made: the work plan was finalized; the SRC-II toxicology analysis was completed resulting in recommendations for safe handling of coal-derived fuels during the test program; fuel was delivered to Colt; a subcontract was finalized for modifications to the engine and fuel injection test cells as dictated by SRC-II related industrial hygiene requirements; testing was completed on signal averaging A/D converter to be used in conjunction with a piezoelectric pressure transducer to analyze cylinder traces; a dilution tunnel was designed, fabricated, and shipped; and the fuel system for injection of SRC-II was designed and fabricated specifically for injection of SRC-II.

25440 **(EPRI-AP—1623-Vol.2) Gas turbine combustor performance on synthetic fuels.** DeCorso, S.M.; Pillsbury, P.W.; Bauserman, G.; Mulik, P.R.; Ambrose, M.J.; Stein, T.R. (Westinghouse Electric Corp., Concordville, PA (USA). Combustion Turbine Systems Div.). Jun 1981. 223p. NTIS, PC A10/MF A01.

The purpose of Project RP989-1 was to determine the effects of burning coal- and shale-derived synthetic liquid fuels in state-of-the-art gas turbine combustors. Ten types of coal-derived liquid fuels from the SRC-I, SRC-II, EDS, and H-Coal processes, and three hydrogenated shale oil fuels were utilized. The combustion and emission performance of fuels other than petroleum has now been obtained. The main conclusion was that synthetic fuels burned approximately as expected from extrapolation of the combustion results obtained with petroleum fuels. Synthetic fuels with hydrogen content greater than approximately 10% (by weight) and nitrogen content less than approximately 0.35% should be satisfactory for engines of current design. These include a number of the fuels tested. A wider selection of synthetic fuels could be used in engines of a lower pressure ratio and/or turbine inlet temperature. Conversely, designs of higher turbine inlet temperature and/or pressure ratio would require tighter fuel specifications or the development of improved combustor cooling, smoke performance, and NO/sub x/ suppression. The other combustion characteristics of the synthetic fuels were satisfactory. They burned smoothly, cleanly, and efficiently, and ignited readily with no significant coking. All fuels were handled acceptably by standard fuel forwarding systems. Emissions of CO, UHC and particulates were at about the same low levels as for petroleum distillate No. 2. Analysis and correlation of NO/sub x/ emissions and wall temperature versus fuel properties have been developed for prediction of these effects over a range of operating conditions. Volume I is a summary that presents the main conclusions and the results of these correlations of the data. This volume presents the detailed test and analysis results.

25441 **(EPRI-AP—1849) Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report.** Strong, R.E.; Eagle, K.H. (Westinghouse Electric Corp., Concordville, PA (USA). Combustion Turbine Systems Div.). May 1981. 77p. NTIS, PC A05/MF A01.

Research is reported on a project in which the primary objective was to demonstrate that a valid, dependable method can be developed to forecast the reliability of a proposed advanced thermo-mechanical component or system of the type used in gas turbine combined cycle plants. A fundamental methodology was developed with potential applicability to a wide range of components. Limited verification was achieved by the application of this methodology to a combustion turbine unit. A more complete verification will require the applcation of the methodology to a number of components of varying complexity in order to define the factors that limit applicability and accuracy. This method will be very beneficial to the utility industry evaluating equipment still in the design and manufacturing stages when no specific data are available to establish failure rates. The first task of this program was to identify current methods for developing reliabilty forecasts for thermomechanical equipment similar to the type used in gas turbine combined cycle plants. The results of this task demonstrated that no existing methodology was completely applicable. Emphasis was then placed on efforts to modify or develop a new forecast methodology utilizing a decision tree technique. Measurement of the usefulness and validity of a forecast methodology was included and is described. The validation is based on a comparison of the probability distributions of the prediction with actual field results. A guidelines manual for the overall methodology was prepared and published as a separate report.

25442 **(EPRI-CS—1818) Exhaust-fired fluid-bed combined cycle for power generation: preliminary feasibility study. Final report.** Foster-Pegg, R.W.; Kosinski, A.J.; Smith, J.W.; Martin, G. (Westinghouse Electric Corp., Concordville, PA (USA). Combustion Turbine Systems Div.; Babcock and Wilcox Co., Alliance, OH (USA). Contract Research Div.). Apr 1981. 138p. NTIS, PC A07/MF A01. Order Number DE81903305.

This report addresses the technical feasibility of applying an atmospheric fluid-bed combined cycle for a 300-MW or larger power generating station. The fluid bed is directly fired with coal and contains surface to provide indirect heating to the compressed air of the combustion turbine. The technical investigation encompassed several key areas to determine risks involved and the path to be followed in future efforts. Among the key areas studied are cycle optimization, fluid-bed reference design, combustion turbine design changes, air piping and ducting, and cycle growth potential.

25443 **(EPRI-CS—1845) Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report.** Wenglarz, R.A.; Alvin, M.A.; Schneider, S.J. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). May 1981. 142p. NTIS, PC A07/MF A01.

Large utility combustion turbines have not expanded PFB (pressurized, fluidized bed) combustion gases. Consequently, the erosion, deposition and corrosion tolerances of these machines to particulates and chemical contaminants contained in the gases is not known. This report provides an assessment of tolerances for utility turbines operating with PFBC power plants. Differences between erosion environments produced in large utility turbines and cascades or small turbines are explored to evaluate the extent which cascade and small turbine test results indicate erosion tolerances of large utility turbines. Experimental data are complemented with mechanistic analyses to describe general erosion/deposition/corrosion potential characteristics expected for PFBC power plant turbines and to evaluate tolerances for two existing utility turbines, each operating with a specific PFBC power plant. Intervals for turbine maintenance due to erosion and deposition degradations are projected for alternative particulate cleanup systems used with each plant. Effects of combustor operating conditions (excess air levels and sulfur removal efficiencies) on turbine corrosion/deposition potential are explored. Turbine design modifications are identified which might improve tolerances to PFB combustion gases and potentially increase turbine reliability and reduce gas cleanup and turbine maintenance costs.

25444 **(EPRI-CS—1846) Evaluation of ceramic fiber filters for hot gas cleanup in pressurized fluidized-bed combustion power plants.** Ciliberti, D.F.; Lippert, T.E. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). May 1981. 86p. NTIS, PC A05/MF A01. Order Number DE81903303.

This report describes results of testing at high temperature and high pressure (HTHP) two ceramic baghouse filter concepts for PFBC application. The first concept tested was a 19-bag arrangement supplied by the 3M Company and Buell Envirotech. These bags were of a woven fiber, operated at 0.85 and 1.7 m/min (2.8 to 5.6 ft/min), and pulse-jet cleaned on-line. The second device tested, a fibrous mat concept (referred to herein as felted) supplied by Acurex/Aerotherm, was a five-bag device that operated at higher-than-conventional filter face velocities of about 3 m/min (10 ft/min). Because of the higher filter velocity, this system was designed so that essentially off-line cleaning of individual bags could be carried out. Very promising results were obtained during the testing of both systems. Both gave 99+% overall efficiencies at 427°C (800°F) and 815°C (1500°F) at 1138 kPa (150 psig) test conditions on a test dust composed of PFBC ash and fine limestone. Both systems were able to be cleaned by the pulse-jet method, and over the period of testing apparently stable filter-clean cycles were established. Further development work is recommended on both devices for PFBC application.

25445 **(EPRI-CS—1847) Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants.** Ulerich, N.H.; Newby, R.A.; Keairns, D.L. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). May 1981. 140p. NTIS, PC A07/MF A01.

The sulfur removal performance of pressurized, fluidized-bed combustion power plants operated in the range of 16 to 20 atmospheres pressure is evaluated. This pressure range has previously received little attention and is of potential commercial interest. Eleven limestones and dolomites were characterized and tested for sulfation activity under a variety of conditions of temperature, pressure, excess air, and particle size to provide the basis for commercial sulfur removal projections. A pressurized thermogravimetric balance was used to obtain kinetic data. Sorbent particle diameter was found to have a significant effect on the sulfation rate, temperature and excess air less so. Great variation between the behavior of the eleven sorbents was apparent. Increased pressure results in a need for increased gas residence time or reduced sorbent particle size in the bed in order to achieve calcium-to-sulfur ratios compared with lower pressure operation.

25446 (EPRI-WS—80-127, pp 2.9-2.18) **Retard back-end corrosion and acid emissions in oil-fired boilers.** Ecock, E.J.; Cerda, E.G.; Rocco, M.; Bonett, D. (Consolidated Edison Co., New York, NY). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

The use of MgO-addition to the flue gas is a generally accepted approach. It is of the utmost importance to monitor operating conditions - i.e., draft drop, ash free-acidity, flue-gas acid dew point, particular emissions, SO_2/SO_3 and air heater inspections. Con Edison has its own test groups as well as information obtained from vendors and consulting firms. Although Con Edison is convinced that MgO powder is effective as a flue-gas neutralizer, other back-end-type treatments are being sought. While various additive suppliers are making claims, those of the public utility sector who operate large steam generators must join together to avoid unnecessary and costly trials. There is much at stake, as both the savings and the costs can be very significant.

25447 (EPRI-WS—80-127, pp 2.63-2.64) **Cyclical warm boiler washing using furnace soot blowers in conjunction with additive usage.** Adams, J.F. (Virginia Electric and Power Co., Richmond). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

Five soot-blowing sequences, each lasting about an hour, are performed during a boiler fireside wash. The soda ash is added at a high rate during the initial soot-blowing sequence and reduced for each successive sequence. By the end of the fifth sequence, all of the soda ash has been used to neutralize the ash. The furnace waterwalls are intentionally not washed, since the ash-additive coating insulates them and helps to obtain proper steam temperatures. This method of removing furnace ash has been proven by both LILCO and Vepco. It was found to be economical and efficient without any detrimental effects to the tubes. There are several advantages to this method of boiler cleaning: (1) Minimum outage time. With practice, the entire procedure takes only 24 hours. It can be done when an outage not related to the boilers occurs. (2) Station personnel can handle the entire job. At Vepco, the soda ash is mixed and blended by use of a medium-sized tank and pump; no contractor is required for any part of the job.

25448 **(PB—81-110256) Prediction of socio-economic impacts by the proposed unit No. 9 at Vienna and alternative sites.** Blinder, C.L. (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). Aug 1980. 236p. NTIS, PC A11/MF A01.

Economic and fiscal impacts resulting from construction of a 600 MW coal-fired power plant were estimated for the Vienna Site and two alternates. These impacts were assessed using a model developed for the Maryland Department of Natural Resources. Potential transmission line, rail, and pipeline corridors were identified that would minimize environmental and land use impacts. The effects of coal transportation and commuting construction workers on the local transportation network were examined, as were the visual effects of the power plant.

25449 **(PB—81-113151) Design study of the VTE boiler cycle for the desalination of sea water. Volume 1. Main report and Appendix A. Final report.** Kamal, I. (Envirogenics Systems Co., El Monte, CA (USA)). Jan 1980. Contract DI-14-34-0001-8565. 213p. NTIS, PC A10/MF A01.

Flow sheets have been developed for the VTE boiler cycle, which is a dual-purpose power/desalination system. Computer programs have been written and used to calculate equivalent performance ratios and process data for the VTE boiler and the conventional dual-purpose plant with both extraction and back-pressure schemes of steam supply to the evaporator. High EPTs are obtained for the VTE boiler when (a) the heating system is withdrawn from the turbine at a low pressure, (b) the secondary turbine is designed for high efficiency, (c) the number of effects in the VTE boiler is small and (d) the temperature driving potential is small. The thermal loss to the power cycle is low, with the VTE boiler acting like a moisture separator returning dry, steam to the turbine cycle at conditions close to those under which the steam was withdrawn. Cost studies have been carried out for the VTE boiler and the conventional system for 50 MWe/1 mgd. The studies show that the energy requirement of the VTE boiler is less than half that of the conventional plant when both are designed for optimum performance. Further work on the development of economical and efficient low-pressure turbines is necessary in order to realize the potential of the VTE boiler.

25450 **(PB—81-119737) Environmental assessment of cooling tower drift and vapor emissions for the proposed Vienna Unit No. 9.** Davis, E.A.; Freeman, V.T. (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). Aug 1980. 210p. NTIS, PC A10/MF A01.

This report provides an assessment of the environmental effects of the drift and vapor emissions from the 600 MWe proposed expansion of the generating station at Vienna, Maryland and from the alternative sites at Church Creek and Deep Branch, Maryland. Round mechanical, rectangular mechanical, and natural draft cooling towers are studied. Effects examined include: (1) Salt deposition from the various sources and its effect on soil, crops, native vegetation and man-made structures; (2) The frequency and lengths of visible vapor plumes: and (3) The enhancement of fog and ice on the proposed Route 50 bypass at Vienna to be located 350m north of the cooling towers.

25451 **Receipt and preparation of biomass as an energy source.** Brown, J.A. (Rust Eng Co, Birmingham, Ala). pp 53-58, Book 1 of TAPPI engineering conference proceedings: books 1 through 3, 1979. Atlanta, GA; TAPPI (1979).

From General Electric colloquium; Schenectady, NY, USA (29 Nov 1979).

This paper describes the method of receiving and preparing biomass (living matter) as an energy source at a site in the state of Maine. A nominal 50-MW plant is proposed for construction at the site to convert biomass to steam and electrical energy using the cogeneration principle. Specific details are provided on the equipment used in receiving the biomass; how the material is handled and

stored; the method of reclaiming the material; the steps of operation required for firing; the design criteria for such an operation; the concept of operation; the architectural and structural considerations necessary for this site due to extremely cold winters; and the major equipment, required for this particular type of operation.

2002 Environmental Aspects

REFER ALSO TO CITATION(S) 24905, 24926, 24933, 24937, 24949, 24958, 25063, 25445, 25446, 25448, 25450, 25840, 26288, 26296, 26323, 26324, 26399

25452 (BNL—51329) Semiannual report for the period April 1-September 30, 1980 of work on: (1) superconducting power transmission system development; and (2) cable insulation development. (Brookhaven National Lab., Upton, NY (USA)). 24 Nov 1980. Contract AC02-76CH00016. 101p. NTIS, PC A06/MF A01. Order Number DE81026045.

Progress is discussed in developing an underground superconducting power transmission system which would be economically and technically attractive to electric utilities. Information is included on the production and testing of superconductors; materials development and testing for cable insulation; and engineering projects related to cable production and cable testing facilities. (LCL)

25453 (EPRI-CS—1806) Evaluation of 10-MW Shawnee cocurrent scrubber. Final report. Crowe, J.L.; Jackson, S.B.; Henson, L.J. (Radian Corp., Austin, TX (USA)). Apr 1981. 318p. NTIS, PC A14/MF A01. Order Number DE81903306.

In 1976 to 1977 TVA and the Electric Power Research Institute (EPRI) jointly funded a 1 MW pilot test (Colbert pilot plant) of the cocurrent scrubber concept. Based upon promising results from the pilot test, EPRI funded TVA to design and operate a 10 MW prototype cocurrent scrubber at the Shawnee Test Facility to further evaluate and demonstrate the cocurrent scrubber concept. The primary advantages of this scrubber concept, which were identified in the pilot tests, were smaller physical size of the scrubber and the general arrangement of the scrubber equipment which have a major impact upon capital investment and operating cost. The major objectives of this test program at Shawnee were to identify operating conditions for satisfactory removal of SO_2 and particulates from the flue gas using lime and limestone slurries, to demonstrate the reliability of scale unit. During the EPRI test program, while operating at a scrubber superficial gas velocity of 27 ft/sec, an SO_2 removal efficiency of greater than 90% was obtained with lime or limestone as an absorbent. However, total system reliability was not demonstrated at this scrubber gas velocity because of solids deposition in the mist eliminator and reheater. The highlights of this prototype cocurrent scrubber test program are presented in this report.

25454 (EPRI-CS—1843) Cyclic reheat for FGD: status report. Final report. Lee, G.C.Y. (Bechtel National, Inc., San Francisco, CA (USA)). May 1981. 134p. NTIS, PC A07/MF A01.

In this study cyclic reheat refers to the extraction of heat from the flue gas entering a scrubber of a wet FGD system and using that heat to elevate the temperature of the flue gas leaving the scrubber. Heat recovery by this means eliminates the fuel or steam consumption normally employed for FGD reheat. The objectives of this study are to publicize the status of cyclic reheat research activities, to characterize Southwestern Public Service's Harrington Station cyclic reheat installation, and to evaluate the economics of cyclic reheat by comparison with conventional reheat systems. Three conventional-type reheat systems - in-line steam, hot-air injection, and oil-fired reheat - were evaluated and compared with the Harrington-type cyclic reheat system for both low-sulfur and high-sulfur coal cases. Study conclusions include the following: considerable research activities on cyclic reheat are being conducted in the United States and Japan with promising results. Cyclic reheat operating experience at Harrington Station has been superior, and system performance is reasonably close to design. The major advantage of cyclic reheat is energy savings which is realized at the expense of higher capital cost. For high-sulfur coal application with flue gas entering the heat extractor at 300°F, a cyclic reheat system has been estimated to have a 30-year levelized cost advantage over a conventional in-line steam reheat system when the cost of medium pressure steam is valued at more than $2.30 per thousand pounds.

25455 (EPRI-WS—80-127, pp 3.16-3.28) Flue gas conditioning experience at Tampa Electric Company. Hudson, J.L. Jr. (Tampa Electric Co., FL). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

Tampa Electric Company has been very successful in using ammonium sulfate injected after the air preheater as a flue gas conditioning chemical for use with east Kentucky low-sulfur coal, some west Kentucky low-sulfur coals, and blends of west Kentucky high-sulfur coal and Polish or Australian coal. We have found the flue gas conditioning to add collection capacity to the precipitator, enabling us to delay forced outages due to precipitator problems.

25456 (EPRI-WS—80-127, pp 3.29-3.40) Fly-ash conditioning: status and findings of EPRI program. Altman, R.F. (Electric Power Research Inst., Palo Alto, CA); McKinney, B.G.; Giovanni, D.; Gooch, J.P. May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

The Electric Power Research Institute, through its contractor, Southern Research Institute, has initiated a project to investigate the effect of flue-gas conditioning on the operation of full-scale electrostatic precipitators. Tests are being performed at sites volunteered by the utility industry where gas conditioning is being used successfully. Three field tests have been completed and current plans call for an additional three field tests. At each site, the improvement in precipitator collection efficiency will be measured, and the mechanisms through which gas conditioning affects the collection process will be investigated. To understand the conditioning mechanisms, it is necessary to supplement the field measurements with extensive laboratory studies, consisting of fly-ash resistivity measurements and chemical analysis of field samples of various types. At the conclusion of the field studies, a guidelines document will be prepared which will identify the circumstances under which gas conditioning will be effective and provide an economic evaluation of gas conditioning and alternative methods of improving particulate collection.

25457 (EPRI-WS—80-127, pp 3.41-3.43) Summary of discussion-group sessions on fly ash conditioning: coal firing. McKinney, B.G. (Electric Power Research Inst., Chattanooga, TN). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

Electric utilities are being required to improve and/or upgrade performance of some electrostatic precipitators (ESPs) to meet environmental requirements. There are various reasons that some new and existing ESPs do not perform at the level now required. In many cases, the coal supply has changed since the ESP was designed. To upgrade the performance of an ESP, several alternatives are available to the electric utility. One possibility is fly-ash conditioning, which in some cases is the most economical alternative available if the unit can be brought into compliance this way. The data on fly-ash conditioning does not allow a decision to be made on the use of fly-ash conditioning agents (FCAs) without an expensive and time-consuming experimental program at each site where ESP performancee improvement is required. There are no substantiated theories on why, how, etc., fly-ash conditioning will or will not improve ESP performance at a given unit which is using a particular coal. Due to the many current uncertainties on the use of fly-ash conditioning agents, several areas were discussed for which more information is needed. A series of needed actions was proposed.

25458 (EPRI-WS—80-127, pp 3.52-3.55) Summary of special discussion group on acid plumes and fallout. Anson, D. (Battelle Columbus Labs., OH). May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

Some problems have become evident after the ESPs of the affected units were improved, and solid particle emission rates were reduced to about 0.01 lbs/million Btu. The brownish plume characteristic of much higher dust-emission rates was eliminated, but was succeeded by a persistent blue-white plume. This appearance usually is associated with stable mists of very fine sulfuric acid, and is familiar to those who have operated oil-fired plants on high-sulfur oil. Other reports have included occasional evidence of a bluish plume with dust loadings of 0.02 to 0.04 lbs/million Btu. The limiting dust loading, above which a blue color is not noticeable, is expected to depend on the sulfur level and ash alkalinity of the coal. Therefore, these values can be taken only as guides. The visible evidence of acid as a stack plume is accompanied by severe acid deposits in low-temperature duct work. Reduction of the dust burden in stack emissions from boilers at levels required to meet new source performance standards (0.3 lbs/million Btu) can lead to problems of in-plant corrosion and undesirable stack emissions. Magnesium-based additives, which have proved effective in oil-fired plants, do not appear to be the best choice for coal-fired plants with back-end problems. The use of ammonia to deal with SO_3-related problems in coal-fired plants warrants further investigation. The possible production of ammonium bisulfate is a matter for concern, and the guidelines for use of ammonia are needed to avoid distribution and handling problems. The action of manganese-based additives, both in combating SO_3-related problems and in their reported effects on high-temperature deposits, requires further examination and explanation.

25459 **(NUREG/CR—1581-V-1) Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume I. Dispersion from single and multiple source natural draft cooling towers. Technical report.** Policastro, A.J.; Carhart, R.A.; Ziemer, S.E.; Haake, K. (Argonne National Lab., IL (USA)). Sep 1980. 496p. NTIS, PC A21/MF A01.

Fifteen mathematical models for visible plume prediction from natural draft cooling towers are evaluated theoretically and tested with 39 sets of single-tower visible plume field data from three sites. Seven of these models with the capability of treating plumes from multiple towers are further tested with 26 sets of multiple tower data from two sites. The visible plume outlines provided by these data give information on the trajectory of the plume as well as dilution. The model/data comparisons prepared in this study revealed systematic behaviors in the predictions of most models which were able to be traced back to model assumptions. A wide range of predictions was found to occur among the models. No one model performed consistently well for all data sets. Theoretical analysis of the model formulations revealed that models which correctly predict the plume trajectory due to the entrainment mechanism alone will overpredict dilution. The more successful models employ an additional mechanism to provide additional bending without additional mixing. The correctness of any of the additional bending mechanisms remains to be determined. The model/data discrepancies are partly due to model errors and partly due to data measurement errors. The accuracy of the data makes it unlikely for a model to predict better than a factor of 1 1/2-2 in most, perhaps 90%, of all data cases.

25460 **(NUREG/CR—1581-V-2) Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 2. Salt drift deposition from natural draft cooling towers. Technical report.** Policastro, A.J.; Dunn, W.E.; Breig, M.L.; Ziebarth, J.P. (Argonne National Lab., IL (USA)). Sep 1980. 442p. NTIS, PC A19/MF A01.

Twelve mathematical models for salt drift deposition from natural draft cooling towers are evaluated in terms of performance with prototype data and validity of theoretical assumptions. Model predictions are compared with field data acquired at the Chalk Point Power Plant during 1975, 1976, and 1977. Large, often several orders of magnitude differences among model predictions existed for runs with the 1975-1977 data. Since the field data are limited, extrapolation of the models' performance to significantly different types of environmental conditions and farther from the tower than 1 km should be done with caution. Each model reviewed was shown to have limitations in two categories. There were assumptions that were either not correct physically or not state-of-the-art. Secondly, there were assumptions whose correctness is presently unknown. Sensitivity and comparative studies were also conducted and are described.

25461 **(NUREG/CR—1581-V-3) Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 3. Plume rise from mechanical draft cooling towers. Technical report.** Dunn, W.E.; Cooper, G.K.; Gavin, P.M. (Illinois Univ., Urbana (USA). Dept. of Mechanical and Industrial Engineering). Sep 1980. 18p. NTIS, PC A02/MF A01.

Various methods commonly used to predict the length and height of the visible plume produced by an array of mechanical-draft cooling towers are evaluated by comparing predictions with observational data from the Benning Road Power Station and from a small array of towers at the Purdue University Power Plant. Four different approaches - empirical, integral, cloud-physics, and finite-difference - are examined. Statistical estimates of predictive capability are given. Problems inherent in the application of these approaches are discussed. Observations concerning areas of weakness and thus areas of potential improvement are made.

25462 **(ORNL/TM—7801) Effects of sublethal entrainment stresses on the vulnerability of juvenile bluegill sunfish to predation.** Cada, G.F.; Solomon, J.A.; Loar, J.M. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 40p. NTIS, PC A03/MF A01.

This report provides a review of literature concerning the effects of sublethal stresses on predator-prey interactions in aquatic systems. In addition, the results of a preliminary laboratory study of the susceptibility of entrainment-stressed juvenile bluegill to striped bass predation are presented. Juvenile bluegill were exposed to thermal and physical entrainment stresses in the ORNL Power Plant Simulator and subsequently to predation by juvenile striped bass in a susceptibility to predation experimental design. None of the entrainment stresses tested (thermal shock, physical effects of pump and condenser passage, and combination of thermal and physical shock) was found to significantly increase predation rates as compared to controls, and no significant interactions between thermal and physical stresses were detected. The validity of laboratory predator-prey studies and the application of indirect mortality information for setting protective standards and predicting environmental impacts are discussed.

25463 **(PB—81-109720) Prediction of air quality impacts for stack emissions from the proposed Vienna unit No. 9.** Kagan, J.A. (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). Aug 1980. 43p. NTIS, PC A03/MF A01.

Predictions of air pollution concentrations were made using the standard Gaussian plume model with a combination of the Briggs A and Pasquill-Gifford-Turnber B-F dispersion parameters; stability class as determined from Turner's algorithm was modified by shifting to the next more unstable class. Briggs's formulas were used to compute plume rise and inversion layer penetration. Downwash and building wake effects were treated by the EPA recommended approach modified to account for initial plume dilution. Ten years of meteorological data were used as model input; this data base was derived from surface measurements at Salisbury, MD., and rawinsonde data taken at Wallops Island, Virginia. The predicted concentrations were compared with applicable air quality standards.

25464 **(PB—81-110249) Land use and development trends in Dorchester and Wicomico counties.** Blinder, C.L. (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). Aug 1980. 114p. NTIS, PC A06/MF A01.

Land use and development trends are evaluated for areas in the vicinity of a site proposed for construction of a 600 MWe coal-fired power plant and two alternates identified by Delmarva Power and Light Co. The primary site, Vienna, is located in Dorchester County, as is the Church Creek site. The Deep Branch site is in Wicomico County. Employment and population projections presented in this report are baseline estimates of future economic and demographic activity excluding potential impacts of the power plant. The socioeconomic impacts of constructing a 600 MWe power plant at Vienna or the alternate sites are estimated in a com-

panion report (PPSE 8-7) prepared by the author. This report provides useful background material for interpreting the results presented in that publication.

25465 **(PB—81-111312) Chalk Point steam electric station studies Patuxent Estuary studies: ichthyoplankton population studies, 1979. Final report.** Mihursky, J.A.; Wood, K.V.; Kerig, S.; Setzler-Hamilton, E.M. (Maryland Univ., Solomons (USA). Chesapeake Biological Lab.). Apr 1980. 156p. NTIS, PC A08/MF A01.

Two years of riverwide ichthyoplankton data were collected as a part of a series of studies at the Chalk Point Steam Electric Station (SES) to contribute data necessary to evaluate information to be presented in the 316 variance demonstration document scheduled for Units 1 and 2 of this facility during 1981. These studies also provided information on the regional spatial and temporal distribution of fish eggs and larvae required to put nearfield studies conducted by the Potomac Electric Power Company into regional context. The principal species collected were white perch, striped bass, bay anchovy, sliversides, naked goby, yellow perch, and clupeids.

25466 **(PB—81-112435) Thermal effects on primary productivity of phytoplankton, periphyton and macrophytes in Lake Keowee, South Carolina. Report for 1 Jul 72-30 Jun 76.** Dillon, C.R.; Rodgers, J.H. (Clemson Univ., SC (USA). Water Resources Research Inst.). Jan 1980. Contract DI-14-31-0001-3934. 123p. NTIS, PC A06/MF A01.

Productivity of phytoplankton, periphyton and macrophytes at three stations in Lake Keowee was measured from April, 1973 to April, 1975. Average monthly productivity for phytoplankton was 1097.19, 1037.33 and 880.54 mg sq cm/month m0-1 at Station 1.2, and 3 respectively. Both low nutrient concentrations and low productivity classifies Lake Keowee as an oligitrophic lake. This investigation could demonstrate no significant effect of thermally elevated reactor cooling effluents on the productivity of phytoplankton or periphyton.

25467 **(PB—81-112757) A manual for the use of electrostatic precipitators to collect fly ash particles. Final report Dec 78-Feb 80.** McDonald, J.R.; Dean, A.H. (Southern Research Inst., Birmingham, AL (USA)). May 1980. Contract EPA-68-02-2114. 785p. NTIS, PC A99/MF A01.

The report incorporates the results of many studies into a manual oriented toward the collection of fly ash particles (produced by the combustion of pulverized coal) by electrostatic precipitation (ESP). It presents concepts, measurement techniques, factors influencing ESP performance, data and data analysis from a practical standpoint. Extensive use of data from full-size ESPs should familiarize the user with what to expect in actual field operation. The manual covers fundamentals of ESP, mechanical and electrical components of ESPs, factors influencing ESP performance, measurement of important parameters, advantages and disadvantages of cold-side, hot-side, and flue-gas-conditioned ESPs, safety aspects, maintenance, troubleshooting, the use of a computer model for ESP, and features of a well-equipped ESP. Studies considered in this report include those, by various individuals and organizations, on comprehensive performance evaluations of full-scale ESPs, in situ and laboratory measurement of fly ash resistivity, rapping reentrainment, evaluations of the effects of flue gas conditioning agents on ESP performance, fundamental operation of hot-side ESPs, basic laboratory experiments, and development of a mathematical model of ESP. Information from these studies can be used by power plant personnel to select, size, maintain, and troubleshoot ESPs.

25468 **(PB—81-116055) Cooling water intake screening devices used to reduce entrainment and impingement. Topical briefs: fish and wildlife resources and electric power generation, No. 9.** Fritz, E.S. (National Power Plant Team, Ann Arbor, MI (USA)). Jul 1980. 29p. NTIS, PC A03/MF A01.

Cooling water intake screening devices that Fish and Wildlife Service personnel may be expected to assess are identified and described. The devices included are modified vertical traveling screens, single-entrance double-exit screens, horizontal traveling screens, passive intake screens, radial wells, artificial filter beds, and porous dikes. For each device the location, limitations or restrictions, evidence for reducing entrainment and impingement, and major unresolved problems are also discussed.

25469 **(PB—81-119075) Development document for proposed effluent limitations guidelines, new source performance standards, and pretreatment standards for the steam electric point source category. Interim report.** Lum, J.W.; Wright, T.F. (Radian Corp., McLean, VA (USA)). Sep 1980. Contract EPA-68-01-5163. 618p. NTIS, PC A99/MF A01.

This document provides a technical basis for the revision of chemical effluent limitations guidelines for the Steam Electric Power Industry reflecting the Best Available Technology Economically Achievable (BATEA) for existing sources, New Source Performance Standards (NSPS) and Pretreatment Standards. The analysis of pollutants and the technologies applicable to their control has been based on specific waste streams of concern.

25470 **(PB—81-119422) Flue gas desulfurization pilot study: summary of phase I and phase II reports.** (North Atlantic Treaty Organization, Brussels (Belgium). Committee on the Challenges of Modern Society). Apr 1980. 17p. NTIS, PC A02/MF A01.

The initial phase of this study consisted of a survey of existing FGD systems used on larger combustion processes in the NATO countries and Japan.

2003 Power Transmission And Distribution

REFER ALSO TO CITATION(S) 25295, 25641, 25802

25471 **(BDX—613-2449) Tester line voltage monitor.** Millican, G.A. (Bendix Corp., Kansas City, MO (USA)). Jun 1981. Contract AC04-76DP00613. 60p. NTIS, PC A04/MF A01. Order Number DE81025631.

This project was begun to design and then investigate a low-cost line voltage monitor system for use on critical testers. The effect of power transients or surges on testing operations must be known. A line voltage monitor system should be independent of ac line fluctuations; should include monitors for under/over voltages and spikes, with memory storage of disturbance type along with time and date; should display data; should have visual and/or audible indications of a line voltage problem; and should interface with a computer.

25472 **(DOE/ET/29356—6) Study to improve transmission system availability and utilization through identification of critical parameters and transformer performance analysis. Final technical report.** Poyser, T.D. (Westinghouse Electric Corp., Muncie, IN (USA). Large Power Transformer Div.). Mar 1981. Contract AC02-79ET29356. 143p. NTIS, PC A07/MF A01. Order Number DE81025006.

Power transformer availability and utilization are key factors in overall transmission system availability and utilization. A microprocessor-based transformer analysis system (MTAS), can provide improved power transformer availability and utilization through the continuous monitoring and analysis of power transformer operating parameters. The MTAS can provide power transformer loadability data to power system operating centers. The MTAS would continuously monitor selected power transformer parameters, thus providing an early indication of a potential problem, and would allow the utility to schedule the repair work. The use of microprocessors for acquiring the inputs and computing the selected outputs and selected data was investigated. Eight bit microcomputers were determined to be capable of collecting the data, making the computations, and presenting the data to the various users.

25473 **(EPRI-EL—1854) Experimental techniques for investigating the degradation of electrical insulation. Final report.** (National Research Council, Washington, DC (USA). Committee on Dielectrics). May 1981. 144p. NTIS, PC A07/MF A01. Order Number DE81903430.

Organic polymers, particularly polyolefins such as polyethylene, are subject to aging and degradation. The failure of polyolefins occurs by dielectric breakdown, sometimes preceded and facilitated

by minute and simultaneous changes in the chemistry, physics, or mechanics of the insulation. The objective of this study is to assess the range of changes that can occur during the aging and degradation of polyolefin polymers and to evaluate existing and emerging experimental techniques for their ability to detect the sensitive changes and ultimately to predict lifetime characteristics of the materials. This report contains the formal papers given at a workshop on experimental techniques for investigating the degradation of polyolefin insulation. Based on the presentations and the deliberations of a study panel, a number of conclusions and recommendations were reached. These concern polyolefin electrical insulation and the experimental techniques most likely to be useful for detecting early changes and degradation and for predicting the life expectancy of such insulation.

25474 **(EPRI-EL—1860(Vol.2)) Field demonstrations of communication systems for distribution automation. Final report.** (Brown Boveri Compuguard Corp., Pittsburgh, PA (USA); Carolina Power and Light Co., Raleigh, NC (USA)). Jun 1981. Contract AC80-78BP02810. 255p. NTIS, PC A12/MF A01. Order Number DE81025073.

The project used Power Line Carrier (PLC) technology to communicate on a network of active Repeater/Bypass Amplifiers (R/BPs) and Data Panels (DPs). This network was spread over five distribution feeders through two substations in Raleigh, North Carolina. Each substation housed a Communications Processor (CP) which used PLC to communicate with field units mentioned above and a leased telephone line to communicate with the Central Computer Facility (CCF). Communications performance statistics are given and analyzed for effects of time of day, day of week, temperature, humidity, and substation electrical demand. Inferences are drawn from these data about the feasibility of such a PLC system for utility distribution control.

25475 **(EPRI-EL—1860(Vol.3)) Field demonstrations of communication systems for distribution automation. Final report.** (Westinghouse Electric Corp., Raleigh, NC (USA); Detroit Edison Co., MI (USA)). Jun 1981. Contract AC65-80WP15223. 336p. NTIS, PC A15/MF A01. Order Number DE81025260.

The objectives of the one-year demonstration project were to evaluate overall performance of an automated distribution system (ADS) using power-line carrier communications. The ADS was designed to provide both load control and metering information (data acquisition) on the distribution system using bidirectional carrier communications on the distribution lines. The system functions included load control, load survey, remote meter reading, remote time-of-use metering, and the automation of distribution feeder operations. A minicomputer at the Central Station controlled the system, either by manual commands generated by an operator or by a program of automatically scheduled commands. The minicomputer stored data collected from the remote terminals. The measured system performance presents a worst case condition because data collected during this project generally were not adjusted to account for equipment malfunctions. The overall system performance for the period, which includes logged errors of all types, was 77%. Two-way carrier performance for the same period measured 91%. A successful communication is defined as an error-free bidirectional interchange of information between the Central Station and any terminal device. An unsuccessful first or second try (error or time-out) caused the Central Station to immediately repeat the communications (maximum-two repeats). This cycle was logged as one attempt; and a success if any of up to these three attempts were successful. The results of these early tests support the conclusion that distribution line carrier communications is a viable medium for conducting ADS operations. Both experimenters recommend that follow-on efforts be conducted to demonstrate the extended capabilities of distribution line carrier equipments and operating software and additional information be obtained to develop a larger data base related to carrier signal propogation.

25476 **(EPRI-EL—1860(Vol.4)) Field demonstrations of communication systems for distribution automation. Final report.** (Westinghouse Electric Corp., Raleigh, NC (USA); Long Island Lighting Co., Hicksville, NY (USA)). Jun 1981. Contract AC65-80WP15223. 392p. NTIS, PC A17/MF A01. Order Number DE81025261.

This report summarizes the results of a field demonstration of the use of UHF radio links in the 950-MHz portion of the spectrum as a communication medium for performing automated electric power distribution. Prototype radiohardware was combined with logic and control equipment developed by Westinghouse for power-line carrier automated distribution systems. Transceivers were used in the remote interactive terminals. 3dbm transceivers were used in the Central Base Station and the three Primary Radio Terminals, which functioned as system repeaters. Pre-installation field-strength measurements were made along selected radials and in spot locations to characterize the anticipated field-strength contours that would be encountered during the operational testing. A propagation model was developed that accurately predicted the conditions actually recorded. Post-installation measurements were used to further calibrate the computer model. The resulting propagation analysis proved exceedingly effective in characterizing a UHF radio system for digital communication. Data collected during a 10-month operational period supports the conclusion that 950-MHz radio is a viable communications medium for performing utility automated distribution functions. The system consists of 250 remote terminals, each interrogated from three sites. This provides 750 paths for communication performance evaluation.The reliability of the prototype radio units used in this project fell below that predicted through MTBF analysis, and did not meet utility reliability standards. The logic and control circuitry and central station required very little maintenance during the test.

25477 **(EPRI-EL—1868) Broadcast radio system for distribution communications. Final report.** Martinez, L. (Altran Electronics, Inc., Harbor City, CA (USA)). Jun 1981. 103p. NTIS, PC A06/MF A01.

The goal of this project is to develop and test a prototype bidirectional radio communication concept that will be sufficiently reliable and cost effective to satisfy most utility requirements. EPRI contracted with Altran Electronics to fabricate the prototype radio system for test and evaluation by Southern California Edison (SCE), the Host Utility. The system concept uses a phase-modulated (PM) digital control signal superimposed in a non-interfering manner on existing AM broadcast station transmissions to provide a forward link to remote points. The return link uses a low power narrowband VHF radio transmitter at each remote point to communicate digital information to the utility central station via a central VHF receiver. These VHF transmitters are synchronized by the broadcast station to provide extremely stable communications and improved range and maximum system reliability. Altran designed and fabricated 50 prototype devices that were installed by SCE for approximately six months testing. The clear channel broadcast station KNX, a CBS station in Los Angeles, was employed to conduct system tests. It is concluded by Altran and SCE that an AM broadcast station is ideal for transmitting digital PM signals, in the manner proposed, and no interference was detected between the broadcast programming and the digital load management signals. Furthermore, relatively simple, reliable, inexpensive radio receivers can be designed to detect and decode these signals. The results also indicate return-link transmitters can be synchronized with the broadcast station in a practical and economical manner to achieve utility requirements for distribution automation.

25478 **(EPRI-EL—1872) Free and forced convective cooling of pipe-type electric cables. Volume 1: forced cooling of cables. Final report.** Chato, J.C.; Crowley, J.M. (Illinois Univ., Urbana (USA)). May 1981. 286p. NTIS, PC A13/MF A01. Order Number DE81903309.

A multi-faceted research program has been performed to investigate in detail several aspects of free and forced convective cooling of underground electric cable systems. There were two main areas of investigation. The first one reported in this volume dealt with the fluid dynamic and thermal aspects of various components of the cable system. In particular, friction factors for laminar flow in the cable pipes with various configurations were determined using a finite element technique; the temperature distributions and heat transfer in splices were examined using a combined analytical numerical technique; the pressure drop and heat transfer characteristics of cable pipes in the transitional and turbulent flow regime were determined experimentally in a model study; and full-scale model experimental work was carried out to determine the fluid dynamic and thermal characteristics of entrance and exit

chambers for the cooling oil. The second major area of activity, reported in volume 2, involved a feasibility study of an electrohydrodynamic pump concept utilizing a traveling electric field generated by a pumping cable. Experimental studies in two different configurations as well as theoretical calculations showed that an electrohydrodynamic pump for the moving of dielectric oil in a cable system is feasible.

25479 **(EPRI-EL—1872(Vol.2)) Free and forced convective cooling of pipe-type electric cables. Volume 2: electrohydrodynamic pumping. Final report.** Chato, J.C.; Crowley, J.M. (Illinois Univ., Urbana (USA)). May 1981. 91p. NTIS, PC A05/MF A01.

A multi-faceted research program has been performed to investigate in detail several aspects of free and forced convective cooling of underground electric cable systems. There were two main areas of investigation. The first one, reported in Volume 1, dealt with the fluid dynamic and thermal aspects of various components of the cable system. In particular, friction factors for laminar flow in the cable pipes with various configurations were determined using a finite element technique; the temperature distributions and heat transfer in splices were examined using a combined analytical numerical technique; the pressure drop and heat transfer characteristics of cable pipes in the transitional and turbulent flow regime were determined experimentally in a model study; and full-scale model experimental work was carried out to determine the fluid dynamic and thermal characteristics of entrance and exit chambers for the cooling oil. The second major area of activity, reported in this volume, involved a feasibility study of an electrohydrodynamic pump concept utilizing a traveling electric field generated by a pumping cable. Experimental studies in two different configurations as well as theoretical calculations showed that an electrohydrodynamic pump for the moving of dielectric oil in a cable system is feasible.

25480 **Multiterminal hvdc system representation in a transient stability program.** Sato, N.; Chan, S.M.; Dravid, N.V.; Burns, A.L.; Vithayathil, J.J. (US DOE, Portland, Oreg). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Power Apparatus and Systems ;* **PAS-99**: No. 5, 1927-1936(Sep-Oct 1980).

A method is described for representing parallel connected, multiterminal HVDC systems in a general-purpose transient stability program. The models for the dc converters, dc-terminal controller, and dc network are described in detail. Based on the models, equations and solution procedures for simulating dc faults and other disturbances are developed. The effectiveness of the solution algorithm is demonstrated on a 3-terminal and a 7-terminal system. Paper No. F80 198-2.

25481 **Demonstration of a helical armature for a superconducting generator.** Conley, P.L.; Kirtley, J.L. Jr.; Hagman, W.H.; Ula, A.H.M.S. (MIT, Cambridge, Mass). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Power Apparatus and Systems ;* **PAS-99**: No. 4, 1642-1651(Jul-Aug 1980).

21 NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 25435, 25540, 25549, 25614

25482 **(DOE/ET/34009—T1) Study of factors governing US utility nuclear power decisions.** (Stoller (S.M.) Corp., New York (USA)). May 1980. Contract AC02-79ET34009. 49p. NTIS, PC A03/MF A01.

Under DOE contract No. DE-AC02-79ET34009, The S.M. Stoller Corporation has conducted a study of US utility attitudes toward nuclear power. In the course of this study SMSC carried out a utility survey the objectives of which were: (1) to identify and rank in importance the governing considerations in actions taken in the past three years to cancel or defer nuclear projects, and (2) to gain insight into the circumstances and attitudes likely to govern new base-load commitments over the next several years. During the survey, contacts were made at the senior management level with utilities representing approximately half of the country's total electric capacity and two-thirds of its present nuclear commitment. Analysis of the responses led to the conclusion that most, if not all, of the decisions reached by the respondent utilities in the past several years to cancel or defer nuclear projects were triggered by one or a combination of the following four considerations: financial constraints; reduction in expected system load growth; schedule delay in licensing and construction and/or unpredictability; and adverse state government policies or attitudes regarding nuclear power.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 25500, 25517, 25522, 25541, 25542

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 25500, 25505, 25506, 25522, 25525, 25528, 25529, 25530, 25531, 25532, 25533, 25536, 25539, 25541, 25542, 25543, 25544, 25545, 25547, 25548, 25550, 25551, 25552, 25553, 25554, 25555, 25557, 25558, 25559, 25560, 25561, 25562, 25563, 25564, 25565, 25566

25483 **(DLCS—5000181) [Shippingport Atomic Power Station]. Quarterly operating report, first quarter 1981.** (Duquesne Light Co., Shippingport, PA (USA)). 1981. Contract AC11-76PN00292. 25p. NTIS, PC A02/MF A01.

At the beginning of the first quarter of 1981, the Shippingport Atomic Power Station was operating with the 1A, 1B, 1C, and 1D reactor coolant loops and the 1AC and 1BD purification loops in service. The 1A, 1B, and 1C 991 psig self-actuated steam relief valves remained gagged during the quarter to prevent leakage through the valve seats. The 1D steam relief valve was removed during the spring 1980 shutdown for repairs and a blind flange was installed in its place. Gagging and/or removing of redundant relief valves is permitted by ASME Code and approved operating procedures. During the quarter, the Station was operated for Duquesne Light Company System grid at maximum base load with the exception of two short duration shutdowns. The LWBR Core has generated 20,645.54 EFPH from start-up through the end of the quarter. There were no radioactive liquid discharges from the Radioactive Waste Processing System to the river this quarter.

2103 Power Reactors, Non-breeding, Graphite Moderated

25484 **(CONF-810606—52) Sorption of iodine on low-chromium-alloy steel.** Osborne, M.F.; Briggs, R.B.; Wichner, R.P. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE81023271.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The sorption behavior of iodine on the surfaces of 2 1/4% Cr-1% Mo steel was investigated as a part of the High Tmeperature Gas-Cooled Reactor (HTGR) Chemistry Program at Oak Ridge National Laboratory (ORNL). The primary objective of these tests was to determine the equilibrium sorptive capacity of this alloy, which comprises most of the cooler regions of HTGR coolant circuit, under representative conditions. The data will be used to improve the capability for predicting, with computer programs, iodine deposition as functions of temperature and location in the primary circuit.

25485 **(GA-A—16234) Accuracy of finite-element models for the stress analysis of multiple-holed moderator blocks.** Smith, P.D.; Sullivan, R.M.; Lewis, A.C.; Yu, H.J. (General Atomic Co., San Diego, CA (USA)). 1981. Contract AT03-76ET35300. 10p. (CONF-810801—35). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Two steps have been taken to quantify and improve the accuracy in the analysis. First, the limitations of various approxima-

tion techniques have been studied with the aid of smaller benchmark problems containing fewer holes. Second, a new family of computer programs has been developed for handling such large problems. This paper describes the accuracy studies and the benchmark problems. A review is given of some proposed modeling techniques including local mesh refinement, homogenization, a special-purpose finite element, and substructuring. Some limitations of these approaches are discussed. The new finite element programs and the features that contribute to their efficiency are discussed. These include a standard architecture for out-of-core data processing and an equation solver that operates on a peripheral array processor. The central conclusions of the paper are: (1) modeling approximation methods such as local mesh refinement and homogenization tend to be unreliable, and they should be justified by a fine mesh benchmark analysis; and (2) finite element codes are now available that can achieve accurate solutions at a reasonable cost, and there is no longer a need to employ modeling approximations in the two-dimensional analysis of HTGR fuel elements. 10 figures.

25486 **(GA-A—16269) Assessment of long-term structural behavior of an asymmetric multi-cavity PCRV.** Cheung, K.C.; Koploy, M. (General Atomic Co., San Diego, CA (USA)). Feb 1981. Contract AT03-76ET35301. 17p. (CONF-810801—11). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Recent design development of the prestressed concrete reactor vessels (PCRVS) for HTGR systems incorporates an asymmetric arrangement of major cavities with the center of the core cavity offset from the geometric center of the vessel. This layout allows a more effective utilization of space. This paper presents the results of an analytical investigation of the creep effects of an asymmetric, off-set core PCRV configuraton using the finite element method. The finite element model was based on the proposed PCRV for a 900-MW(e) steam cycle HTGR. Results indicate that the long-term behavior of an offset core PCRV does not depart significantly from that of a symmetric arrangement.

2104 Power Reactors, Non-breeding, Otherwise Moderated Or Unmoderated

25487 **Measuring and controlling the fouling film formation of HB-40 organic coolant.** Chen, J.W.; Chu, T.J. (Inst. of Nuclear Energy Research, Lungtan, Taiwan). *Ho Tzu K'o Hsueh ;* **17**: No. 1, 51-56(Mar 1980). (In Chinese).

There are two types for test fouling film formation in organic coolant (HB-40). One is a static state with pyrolytic capsule fouling test (PCFT), the other is a dynamic state with small probe fouling test (SPFT) in organic loop of nuclear reactor. Both of them can be adjusted to any given conditions to measure the rate of fouling information. In this report, the PCFT type was developed employing an electricaly heated, vertical cylinder in a capsule containing the liquid under test. The weight of film deposited under specific test conditions establishes the fouling formation rate of HB-40. Film weights between 1 and 15 mg have been obtained from 230-gram coolant samples. Reproducibility of results have been within +- 20%. In this case, the yield of fouling film formation is increased with increasing both the temperatures of probe surface and HB-40 bulk solution. The effects of high boiler contents as well as the additives (chlorine and iron, etc.) are remarkably promoting fouling film formation. Decalin is one of the best additives for both anti-fouling and depolymerization in this experiment.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 25483, 25504, 25518, 25519, 25520, 25521, 25523, 25526, 25537, 25567

25488 **(CONF-800609—17) Response to annealing and reirradiation of AISI 304L stainless steel following initial high-dose neutron irradiation in EBR-II.** Porter, D.L.; McVay, G.L.; Walters, L.C. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 26p. NTIS, PC A03/MF A01.

From 10. international symposium on effects of radiation on materials; Savannah, GA, USA (3 Jun 1980).

The object of this study was to measure the stability of irradiation-induced microstructure upon annealing and, by selectively annealing out some of these features and reirradiating the material, it was expected that information could be gained concerning the role of microstructural changes in the void swelling process. Transmission electron microscopic examinations of isochronally annealed (200 to 1050°C) AISI 304L stainless steel, which had been irradiated at approximately 415°C to a fast (E > 0.1 MeV) neutron fluence of approximately 5.1 x 10^{26} n/m^2, verified that the two-stage hardness recovery with temperatures was related to a low temperature annealing of dislocation structures and a higher temperature annealing of voids and solute redistribution.

25489 **(CONF-810606—56) Depletion analysis and sensitivity study of PHENIX fuel-irradiation experiments.** Biswas, D.; Kallfelz, J.M.; White, J.R. (Georgia Inst. of Tech., Atlanta (USA); Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE81023209.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The experimental results are in the form of various U and Pu atom density ratios (R/sub E/) and burnup (BU) values. The results were for samples irradiated during the first three cycles in the central zone of PHENIX. The time-dependent sensitivity study was performed with the depletion generalized perturbation code DEPTH-CHARGE, to investigate the sensitivity of R/sub E/ to cross sections and to absolute flux level changes. The depletion analysis was performed using ENDS/B-IV data, an (R-Z) model, and the VENTURE Code system. 2 tables.

25490 **(CONF-810804—4) Simulation of fluid thermal fluctuations in the CRBRP steam generator using model testing.** Garner, D.C.; Novendstern, E.H. (Westinghouse Electric Corp., Madison, PA (USA). Advanced Reactors Div.). Apr 1981. Contract AC15-76CL02395. 11p. NTIS, PC A02/MF A01.

From National heat transer conference; Milwaukee, WI, USA (2 Aug 1981).

Testing has been performed using two 1/6 scale models of the Clinch River Breeder Reactor Plant Steam Generators to simulate fluid temperature fluctuations in the sodium. Water was used as the working fluid and the models were fabricated from Plexiglas to facilitate flow visualization. Hydraulic scaling was achieved through Richardson Number and Euler Number similarity. Fluid temperature fluctuations were recorded on movable thermocouples in both the upper and lower semi-stagnant regions of the Steam Generator Module. The magnitude of the temperature fluctuations (peak to peak) were as high as 95% of the maximum potential and were used to assess the amount of fatigue damage of the steam tubes.

25491 **(DOE/SF/00893—T4) Design criteria and candidate concept for high-performance cold trap.** Pohl, L.E. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). 1979. Contract AM03-76SF00893. 10p. NTIS, PC A02/MF A01. Order Number DE81025234.

High performance criteria are outlined for cold traps for LMFBRs and other sodium systems. A cold trap is designed in which the temperature of the incoming sodium is reduced only after it is well within the crystallizer. As the impurities buildup continues to the point where the stage 1 downcomer flow would be impeded, the incoming flow and cooling circuits are switched to stage 2. The sodium in the crystallizer could be stirred by electromagnetic or mechanical means. 2 figures. (DLC)

25492 **(DOE/SF/70030—T18) Status of prototype rupture disc testing in the large leak test rig.** Amos, J.C. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Sep 1979. Contract AT03-76SF70030. 25p. NTIS, PC A02/MF A01. Order Number DE81025236.

The prototype CRBRP double membrane rupture disc assembly is being performance tested in conjunction with the LLTR Series II Large Leak Program. In May 1979, the double membrane disc assembly was inadvertently activated during sodium system pressure instrument calibration. This experience indicated that the

rupture disc burst at essentially the design burst pressure when a gradually increasing state pressure was applied. The area of membrane opening was found to be about 25 to 30% of the cross-sectional area. In July 1979, the disc assembly was again tested (this time in a single membrane configuration) in conjunction with the first LLTR Series II Test A-1a (inert gas injection). Test data indicated that the disc burst in about 35 ms at essentially the design burst pressure with an opening of about 30% of the cross-sectional area. The pressure immediately downstream of the disc dropped below atmospheric pressure following the rupture tube event (releasing high pressure nitrogen into sodium) for about 1.5 seconds before increasing to a maximum of 30 psig. This behavior raises a question on the adequacy of a downstream pressure device for rapid sensing of disc rupture and initiating plant shutdown following a large SWR event. 14 figures.

25493 **(DOE/SF/76026—T7) Decontamination of LMFBR components: report of FY 1979 results.** Hill, E.F. (Rockwell International Corp., Palo Alto, CA (USA). Energy Systems Group). 25 Sep 1979. Contract AT03-76SF76026. 23p. NTIS, PC A02/MF A01. Order Number DE81025235.

The results presented in this report show that the GCA (Glycolic-Citric Acids) process is as suitable or better for use in decontaminating wrought 316 SS and CF8M castings as for decontaminating 304 SS components. The report includes an evaluation of a number of parameters which must be controlled and understood to achieve satisfactory decontamination of LMFBR components: 54 Mn deposition and diffusion, sensitization, metal working, and oxygen control. It was found that castings retain about three times as much 54 Mn as wrought specimens and that this isotope does not diffuse into 316 SS as rapidly as into 304 SS.

25494 **(HEDL-SA—2203-FP) Thermal hydraulics of handling FFTF fuel in sodium and argon, comparing test results with calculated.** Guzek, J.C.; Ingham, J.G. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 22p. (CONF-801107—72). NTIS, PC A02/MF A01. Order Number DE81024113.

From ANS international conference; Washington, DC, USA (17 Nov 1980).

Tests were performed to assess the temperature distributions in FFTF fuel as they are handled in transfer pots, as bare assemblies and in partial fuel pin arrays. The detailed thermal mapping needed for handling FFTF fuel in storage locations, in and out of the reactor, and during transfers in handling machines has been obtained for fuel in stagnant sodium and stagnant atmospheres of argon and helium. Tests also include the thermal assessment of fuel under conditions of forced cooling with argon. The fuel cladding handling thermal limit for preserving reactor test information is 426.7°C and in certain instances a local value of 537.9°C is allowed for short periods of time. The cladding integrity thermal limit for FFTF fuel is 871.1°C. Fuel with a maximum decay heat of 10 kW can be transferred in a sodium filled transfer pot which has been externally conditioned for a high surface emissivity to meet a data preservation thermal limit of 426.7°C. The decay heat limit for handling fuel in stagnant argon is less than 1 kW, if data is to be preserved, and forced cooling of a 5 kW decay heat assembly with argon requires a flow of at least .023 CMS (49 SCFM). Results from the electrical tests of prototypic fuel assembly and pin arrays have identified thermal/hydraulic margins of conservatism and have allowed for the meaningful design handling equipment. Analytical thermal models show favorable agreement with the test results. 12 figures.

25495 **(HEDL-SA—2405-FP) Breached-pin testing in the US.** Mahagin, D.E.; Lambert, J.D.B. (Hanford Engineering Development Lab., Richland, WA (USA)). Apr 1981. Contract AC14-76FF02170. 12p. (CONF-810568—2). NTIS, PC A02/MF A01. Order Number DE81024109.

From IAEA/IWGFR specialist meeting; Karlsruhe, F.R. Germany (11 May 1981).

Experience gained at EBR-II by the late 1970's from a significant number of failures in experimental fuel-pin irradiations forms the basis of a program directed towards the characterization of breached pins. The questions to be answered and the issues raised by further testing are discussed.

25496 **(ORNL/TM—7839) Final analysis of the GCFR exit shield integral experiment.** Ingersoll, D.T.; Cramer, S.N. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 53p. NTIS, PC A04/MF A01. Order Number DE81025856.

An integral experiment has been performed for verification of radiation transport methods used in the design of the exit shield for the proposed gas-cooled fast breeder reactor demonstration plant. The experiment was conducted at the ORNL Tower Shielding Facility and consisted of integral and spectral measurements of the neutron flux transmitted through prototypic mockups of exit shield assemblies and a control rod assembly. The experiment was intended to confirm the predicted effectiveness of the proposed shield design, and to investigate neutron streaming characteristics in the vicinity of a control rod assembly. The analysis was performed using discrete-ordinates and Monte Carlo transport methods and cross section data which are currently used for fast reactor shield design.

25497 **(PNE—81-149) Fast Breeder Blanket Facility (FBBF). Annual report, January 1, 1980-December 31, 1980.** Ott, K.O.; Clikeman, F.M.; Johnson, R.H. (Purdue Univ., Lafayette, IN (USA). School of Nuclear Engineering). Mar 1981. Contract AS02-76ET37237. 14p. (COO—2826-14). NTIS, PC A02/MF A01.

The report contains a summary of the measurements being conducted in the initial two-region blanket loaded into the Purdue University Fast Breeder Blanket Facility. Two of the four sets of measurements, the gamma-ray heating and the neutron spectra measurements as a function of position in the blanket, have been completed and are summarized in the report. The measurements of fission and neutron capture rates are expected to be completed soon and some preliminary results are presented. Reports covering the experimental methods used and the results of each of the measurements are being prepared.

2106 Power Reactors, Auxiliary, Mobile, Package, And Transportable

REFER ALSO TO CITATION(S) 25527

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 25556

25498 **(NE-M—5-23T(4/81)(Rev.)) Steel plates for nuclear and other special applications (ASME SA-647 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Apr 1981. 11p. Nuclear Standards Management Center, Oak Ridge, TN.

This standard covers carbon steel, and medium and high alloy steel plates, sheets, and strips for nuclear and associated applications.

2108 Economics

REFER ALSO TO CITATION(S) 25502

25499 **(DOE/OR/06102—T1) Nuclear reactor maintenance technology assessment. Final summary report, September 16, 1978-September 15, 1979.** Tesar, D.; Ohanian, M.J.; Dugan, E.T. (Florida Univ., Gainesville (USA). Coll. of Engineering). 18 Jul 1980. Contract AS05-78OR06102. 95p. NTIS, PC A05/MF A01. Order Number DE81025021.

Nuclear power plants have exhibited a downtime of one day in four during the past decade. For mature LWR plants, 40% of this downtime is due to forced (unexpected) outages. These outages increase the loss of revenues and increase occupational radiation exposure. In 1979, the cost of maintenance of 70 operating plants was $1 billion per year. A fully remote maintenance technology would save 70% of this cost. PWR steam generator maintenance under fully remote system technology could save $270 million a year.

BWR valve maintenance with fully remote technology could save $54,000,000 a year. Benefits for 150 plants by the early 1990's would be substantially higher; the total yearly savings would amount to $1.8 billion. The PWR steam generator would save $550 million while the BWR valve problem would save $140 million. For nuclear power plant maintenance, the vendors initially took steps to redesign and improve the reliability of the reactor system. The second step was to develop special maintenance tooling. The development of a generalized robotic manipulator having greater precision, dexterity, reliability, obstacle avoidance capability and load capacity is now feasible using microelectronics and computers. In order to drive this more general slave, the master controller must also be generalized to create a man-machine interface as transparent as possible; software modules must be developed which filter jitter, change scales, automaticaly control vision systems, and adapt force feedback signals in order to enhance the speed and precision of operation of the total system. A full complement of component technologies such as sensors, actuators, end-effectors, and remote TV vision systems must also be developed. Several other energy systems represent operations where such remote systems technology may be valuable.

25500 **(HEDL-SA—2322-FP) Resource consequences of reenrichment versus blending.** Owen, P.S. (Hanford Engineering Development Lab., Richland, WA (USA)). 12 Jan 1981. Contract AC14-76FF02170. 6p. (CONF-810606—64). NTIS, PC A02/MF A01. Order Number DE81024104.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Many recent studies, including INFCE and NASAP, have concluded that recycling thermal reactor fuel reduces natural uranium requirements. These studies are based on a common set of assumptions concerning the method of recycling uranium, and consequently have produced quite similar results. It was assumed, however, that the residual uranium would be reenriched rather than blended with higher enriched uranium. This paper will examine several possible alternatives to reenriching residual uranium and discuss the consequences of each.

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory And Calculation

REFER ALSO TO CITATION(S) 26597

25501 **(HEDL-SA—2303-FP) Reactor antineutrino spectra and their application to antineutrino-induced reactions II.** Vogel, P.; Schenter, G.K.; Mann, F.M.; Schenter, R.E. (California Inst. of Tech., Pasadena (USA); Hanford Engineering Development Lab., Richland, WA (USA)). Dec 1980. Contract AC14-76FF02170. 28p. NTIS, PC A03/MF A01. Order Number DE81024089.

The antineutrino and electron spectra associated with various nuclear fuels are calculated. There are substantial differences between the spectra of different uranium and plutonium isotopes. On the other hand, the dependence on the energy and flux of the fission inducing neutrons is very weak. The resulting spectra can be used for calculation of the antineutrino and electron spectra of an arbitrary nuclear reactor at various stages of its refueling cycle. The sources of uncertainties in the spectrum are identified and analyzed in detail. The exposure time dependence of the spectrum is also discussed. The resulting anti ν/sub e/ spectra are then used to calculate the averaged cross sections of the inverse neutron β decay, weak charged and neutral current induced deuteron disintegration, and the antineutrino-electron scattering.

25502 **(HEDL-SA—2323) Assessment of the prevailing physics codes: LEOPARD, LASER, and EPRI-CELL.** Lan, J.S. (Hanford Engineering Development Lab., Richland, WA (USA)). 1981. Contract AC14-76FF02170. 7p. (CONF-810606—69). NTIS, PC A02/MF A01. Order Number DE81024103.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

In order to analyze core performance and fuel management, it is necessary to verify reactor physics codes in great detail. This kind of work not only serves the purpose of understanding and controlling the characteristics of each code, but also ensures the reliability as codes continually change due to constant modifications and machine transfers. This paper will present the results of a comprehensive verification of three code packages - LEOPARD, LASER, and EPRI-CELL.

2202 Components And Accessories

REFER ALSO TO CITATION(S) 25761, 25899

25503 **(EPRI-NP—1858) Studies on Section XI ultrasonic repeatability.** Jamison, T.D.; McDearman, W.R. (Combustion Engineering, Inc., Chattanooga, TN (USA)). May 1981. 170p. NTIS, PC A08/MF A01.

A block representative of a nuclear component has been welded containing intentional defects. Acoustic emission data taken during the welding correlate well with ultrasonic data. Repetitive ultrasonic examinations have been performed by skilled operators using a procedure based on that desribed in ASME Section XI. These examinations were performed by different examination teams using different ultrasonic equipment in such a manner that the effects on the repeatability of the ultrasonic test method caused by the operator and by the use of different equipment could be estimated. It was tentatively concluded that when considering a large number of inspections: (1) there is no significant difference in indication sizing between operators, and (2) there is a significant difference in amplitude and defect sizing when instruments having different, Code acceptable operating characteristics are used. It was determined that the Section XI sizing parameters follow a bivariate normal distribution. Data derived from ultrasonically and physically sizing indications in nuclear components during farication show that the Section XI technique tends to overestimate the size of the reflectors.

2204 Control Systems

25504 **(DOE/SF/01435—T1) Application of a Self-Actuating Shutdown System (SASS) to a Gas-Cooled Fast Reactor (GCFR).** Germer, J.H.; Peterson, L.F.; Kluck, A.L.; Brummond, W.A.; Wong, S.L. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Sep 1980. Contract AC03-77SF01435. 32p. NTIS, PC A03/MF A01.

The application of a SASS (Self-Actuated Shutdown System) to a GCFR (Gas-Cooled Fast Reactor) is compared with similar systems designed for an LMFBR (Liquid Metal Fast Breeder Reactor). A comparison of three basic SASS concepts is given: hydrostatic holdup, fluidic control, and magnetic holdup.

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 26323, 26324, 26328, 26329, 26330, 26399

25505 **Three Mile Island: assessment of radiation exposures and environmental contamination.** Gerusky, T.M. (Pennsylvania Dept. of Environmental Resources, Harrisburg). pp 54-62 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

At 7:04 AM on March 28, 1979, the Bureau of Radiation Protection's duty officer, a nuclear engineer, was notified by the Pennsylvania Emergency Management Agency of an accident at Three Mile Island Unit 2 (TMI-2). He immediately contacted the control room to verify the notification and to receive detailed information. A site emergency had been declared because of high radiation levels detected on remote area radiation monitors in the auxiliary building. Monitoring procedures and measurements recorded following the accident are presented.

25506 **Health impact of the Three Mile Island accident.** Upton, A.C. (New York Univ., NY). pp 63-75 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The only health impact of the Three Mile Island accident that can be identified with certainty is mental stress to those living in the vicinity of the plant, particularly pregnant women and families with teenagers and preschool children. Although increased risks of cancer, birth defects, and genetic abnormalities are potential long-term consequences of low-level irradiation, few if any such effects of the accident are likely, because the collective dose of radiation received by the population within a 50-mile radius of the plant was so small. Estimates of the number of people in the population who may ultimately experience any such effects range from 0.4 to 10, in comparison with hundreds of thousands in the same population who can be expected to develop cancer, birth defects, or genetic abnormalities through natural causes.

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 25099, 25495, 25497, 25520, 25531

25507 **(CONF-810606—55) Experimental and calculational results of an irradiation experiment in EBR-II.** Gilai, D.; Cooper, J.H.; Laing, W.R.; Raman, S.; Stelson, P.H.; Walker, R.L.; Williams, M.L. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

During the period from 1967 to 1970, several actinide samples were irradiated by ANL in the fast reactor EBR-II for approximately 10^{23} nvt. In 1978, ORNL began an experimental determination of the exposure products in the irradiated samples, and to date, 12 of the samples have already been analyzed. In a previous paper preliminary experimental results for ^{239}Pu sample were compared with the exposure products predicted by calculations. In this paper, the comparison is extended to samples of ^{238}U, ^{233}U, ^{232}Th, ^{240}Pu, ^{237}Np, and a second ^{239}Pu sample, with the calculations utilizing the recently released ENDF/B-V data and improved modeling approximations. The experimental results presented in this paper represent a fairly comprehensive set of measurements of actinide burnup in a fast reactor spectrum.

25508 **(DOE/ER/04206—T1) Reactor Sharing Program. Final program report for the period, July 1, 1979 through December 31, 1979.** (Georgia Inst. of Tech., Atlanta (USA)). 1979. Contract AC05-76ER04206. 3p. NTIS, PC A02/MF A01.

The Reactor Sharing Program at Georgia Tech, more fully described in previous summary progress reports, was examined without additional funding to December 31, 1979. This final report is for the period July 1, 1979 to December 31, 1979. Because of the funding limitation, utilization of the reactor was provided for only five (5) separate groups during the 6-month period.

25509 **(HEDL-SA—2105-FP) FFTF-containment air-cleaning system.** Mahaffey, M.K.; Stepnewski, D.D. (Hanford Engineering Development Lab., Richland, WA (USA)). 1981. Contract AC14-76FF02170. 7p. (CONF-810606—63). NTIS, PC A02/MF A01. Order Number DE81023937.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The FFTF Containment can accommodate all design basis events and the hypothetical core disruptive accident with adequate margin without a venting or purging system; however, in concert with the development objective, a system was designed and constructed to evaluate technology related to containment atmosphere venting and cleanup functions. The system can be used to purge high H_2 concentrations or to vent excessive containment pressure. In either case containment atmosphere is exhausted through an aqueous scrubber system consisting of a venturi scrubber and fibrous filter bank.

25510 **(HEDL-SA—2194) Thermal hydraulic analysis of the FFTF core usng SUPERENERGY-2.** Cramer, E.R. (Hanford Engineering Development Lab., Richland, WA (USA)). 1 May 1981. Contract AC14-76FF02170. 15p. (CONF-810606—66). NTIS, PC A02/MF A01. Order Number DE81024088.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The temperature distribution for essentially the whole FFTF core for every cycle of operation is needed. This involves a very large amount of data for both input and output. SUPERENERGY was designed specifically to meet these operational needs. The simplified energy equation mixing model used by SUPERENERGY is well established and extremely economical in both computer storage and run time. The code has proven itself a practical thermal hydraulic modeling tool, capable of coupled calculations for the whole reactor core with a single computer run.

25511 **(HEDL-SA—2300) Cropped-Pin Transfer System for the Fuels and Materials Examination Facility.** Petty, J.A.; Divona, C.J.; Thompson, W.M. (Hanford Engineering Development Lab., Richland, WA (USA)). 6 Dec 1980. Contract AC14-76FF02170. 5p. (CONF-810606—61). NTIS, PC A02/MF A01. Order Number DE81023933.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The detail design for a Cropped Pin Transfer System (CPTS) has recently been completed. Fabrication is now in progress and long-lead embedded components have already been procured and installed in the Fuels and Materials Examination Facility (FMEF). The CPTS provides the capability to make alpha free transfers of irradiated cropped fuel pins and material specimens between the various FMEF Destructive Examination Cells and other on-site Hanford facilities. The CPTS is designed to meet stringent shielding and radioactive contamination containment criteria while at the same time making economical use of commercially available components.

25512 **(HEDL-SA—2316-FP) Hot-cell verification facility.** Eschenbaum, R.A. (Hanford Engineering Development Lab., Richland, WA (USA)). 4 May 1981. Contract AC14-76FF02170. 7p. (CONF-810606—67). NTIS, PC A02/MF A01. Order Number DE81024310.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The Hot Cell Verification Facility (HCVF) was established as the test facility for the Fuels and Materials Examination Facility (FMEF) examination equipment. HCVF provides a prototypic hot cell environment to check the equipment for functional and remote operation. It also provides actual hands-on training for future FMEF Operators. In its two years of operation, HCVF has already provided data to make significant changes in items prior to final fabrication. It will also shorten the startup time in FMEF since the examination equipment will have been debugged and operated in HCVF.

25513 **(HEDL-SA—2373-FP) Effectiveness of criticality safety technology.** Brown, C.L.; Paglieri, J.N. (Hanford Engineering Development Lab., Richland, WA (USA)). 1981. Contract AC14-76FF02170. 7p. (CONF-810606—62). NTIS, PC A02/MF A01. Order Number DE81024111.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Storage of fissionable material at HEDL includes two underground storage pits for vertical storage of mixed oxide fuel pins and assembles for the Fast Flux Test Facility (FFTF). These floor storage arrays, consisting of steel tubes vertically encased in concrete, are designed to enhance criticality safety, fire protection, and safeguards.

25514 **(LA—8856-MS) Reckoning THOR.** Kidman, R.B. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 13p. NTIS, PC A02/MF A01. Order Number DE81023982.

Theoretical computation of the Los Alamos National Laboratory's critical assembly THOR (a thorium-reflected plutonium sphere) yields a high eigenvalue when compared to the experimentally measured eigenvalue. Several calculational improvements are investigated in an effort to reduce the discrepancy. Finally, the experimental procedure of reducing the raw configuration to clean specifications is reviewed.

25515 **(ORNL/TM—7761) Irradiation testing of miniature fuel plates for the RERTR program.** Senn, R.L.; Martin, M.M. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 43p. NTIS, PC A03/MF A01. Order Number DE81025855.

An irradiation test facility, which provides a test bed for irradiating a variety of miniature fuel plates (miniplates) for the Reduced Enrichment Research and Test Reactors (RERTR) program, has been placed into operation. These tests screen various candidate fuel materials on their suitability for replacing the highly enriched uranium fuel materials currently used by the world's test and research reactors with a lower enrichment fuel material, without significantly degrading reactor operating characteristics and power levels. The use of low uranium enrichment of about 20% ^{235}U in place of highly enriched fuel for these reactors would reduce the potential for ^{235}U diversion. The irradiation test facility, designated as HFED, is operating in core position E-7 in the Oak Ridge Research Reactor (ORR), a 30-MW water-moderated reactor. The miniplates will achieve burnups of up to $\sim 2.2 \times 10^{27}$ fissions/m^3 of fuel.

2208 Propulsion Reactors

REFER ALSO TO CITATION(S) 25527

2209 Reactor Safety

REFER ALSO TO CITATION(S) 25173, 25505, 25506, 25607, 25608, 26319

25516 **Separation of krypton and xenon by selective permeation.** Stern, S.A.; Leone, S.M. (Syracuse Univ, NY). *AIChE (American Institute of Chemical Engineers) Journal ;* **26**: No. 6, 881-890(Nov 1980).

The objective of this investigation was to study the separation of krypton and xenon from nuclear reactor atmospheres by selective permeation through silicone rubber capillaries. Effective permeability coefficients for pure krypton xenon, nitrogen, and oxygen were determined between 0 and40/degree/C and at pressure differences across the capillary walls (/DELTA/p) of up to 3.45*10/sup 5/ N/m/sup 2/(50 psi). The silicon rubber capillaries had an O.D. of 635 /mu/m (0.025 in.) and an I.D. of 305 /mu/m (0.012 in.), and were pressurized externally. The effective permeability coefficients decreased with increasing /DELTA/p due to the elastic deformation of the capillaries, in general agreement with a deformation analysis of thick-walled elastic tubes. 21 refs.

25517 **(BNL—29358) Evaluation of the simultaneous action of earthquake, LOCA and SRV on Mark-III containment and drywell structures.** Philippacopoulos, A.J.; Reich, M. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 9p. (CONF-810801—41). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The containment and drywell structures of a generic Mark-III nuclear power facility are investigated with respect to their structural response when subjected to various load combinations that may occur during their operational lifetime. Both structures are idealized with three-dimensional finite element models. In addition a lumped-mass cantilever beam representation of the containment and drywell structures is developed and used for the soil-structure interaction analysis. The types of dynamic events considered include earthquakes, loss-of-coolant-accidents (LOCA) and those generated by safety/relief valve actuations. The evaluation of the combined actions of these dynamic events is first performed by using combination methods such as Absolute Sum (ABS) and Square-Root-of-the-Sum-of-the-Squares (SRSS). A Monte Carlo simulation procedure is subsequently used for probabilistic evaluation of the combinations.

25518 **(CONF-800723—26) Calculational method for combined natural circulation and forced-convection flow in a channel.** Chung, K.S.; Thompson, D.H. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01. Order Number DE81023542.

From 19. national heat transfer conference; Orlando, FL, USA (27 Jul 1980).

This paper presents a finite element solution for combined natural circulation and forced convection flow in a channel. Because the buoyancy force plays an important role in a mixed convection flow, an iteration scheme was used in solving the coupled energy-momentum equations. The momentum equations and the pressure equation are solved to calculate velocity profiles instead of solving the momentum equations with the continuity equation. Though the pressure equation is obtained by using the continuity equation, the continuity principle is reinforced into the momentum equations and the pressure equation at each iteration. Calculations are performed for the combined natural circulation and forced convection case and the forced convection only case.

25519 **(CONF-800723—27) Study of turbulent natural-circulation flow and low-Prandtl-number forced-convection flow.** Chung, K.S.; Thompson, D.H. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023531.

From 19. national heat transfer conference; Orlando, FL, USA (27 Jul 1980).

Calculational methods and results are discussed for the coupled energy and momentum equations of turbulent natural circulation flow and low Prandtl number forced convection flow. The objective of this paper is to develop a calculational method for the study of the thermal-hydraulic behavior of coolant flowing in a liquid metal fast breeder reactor channel under natural circulation conditions. The two-equation turbulence model is used to evaluate the turbulent momentum transport property. Because the analogy between momentum transfer and heat transfer does not generally hold for low Prandtl number fluid and natural circulation flow conditions, the turbulent thermal conductivity is calculated independently using equations similar to the two-equation turbulence model. The numerical technique used in the calculation is the finite element method.

25520 **(CONF-810606—42) Differential sensitivity theory applied to movement of maxima responses.** Maudlin, P.J.; Parks, C.V.; Cacuci, D.G. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE81024968.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Differential sensitivity theory (DST) is a recently developed methodology to evaluate response derivatives $dR/d\alpha$ by using adjoint functions which correspond to the differentiated (with respect to an arbitrary parameter α) linear or nonlinear physical system of equations. However, for many problems, where responses of importance are local maxima such as peak temperature, power, or heat flux, changes in the phase space location of the peak itself are of interest. This summary will present the DST procedure for predicting phase space shifts of maxima responses as applied to the MELT-III fast reactor safety code. An FFTF protected transient involving a $.23/s ramp reactivity insertion with scram on high power was selected for investigation.

25521 **(CONF-810606—54) Two-dimensional computational modeling of sodium boiling in simulated LMFBR fuel-pin bundles.** Dearing, J.F. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE81023267.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Extensive sodium boiling tests have been carried out in two simulated LMFBR fuel pin bundles in the Thermal-Hydraulic Out-of-Reactor Safety (THORS) Facility at Oak Ridge National Laboratory. Experimental results from a 19-pin bundle (THORS Bundle 6A) have been previously reported, and experimental results from a

61-pin bundle (THORS Bundle 9) will be reported soon. The results discussed here are from the 19-pin bundle. Preliminary analysis has shown that the computational methods used and conclusions reached are equally valid for the 61-pin bundle, as well as the 19-pin in-reactor Sodium Loop Safety Facility (SLSF) W-1 experiment. The main result of THORS sodium boiling experimentation is that boiling behavior is determined by two-dimensional effects, i.e., the rates of mass, momentum and energy transfer in the direction perpendicular to the axes of the fuel pins.

25522 **(CONF-810801—3(Summ.)) Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region.** Olsen, C.S. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 5p. NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Oxidation rates of Zircaloy in steam were measured at temperatures between 961 and 1264 K and for duration times between 25 and 1900 seconds in order to calculate, in conjunction with measurements from postirradiation metallographic examination, the prior peak temperatures of Zircaloy fuel rod cladding. These temperature estimates will be used in light water reactor research programs to assess (a) the accuracy of temperature measurements of fuel rod cladding peak temperatures from thermocouples attached to the surface during loss-of-coolant experiments (LOCEs), (b) the perturbation of the fuel rod cladding LOCE temperature history caused by the presence of thermocouples, and (c) the measurements of cladding azimuthal temperature gradients near the thermocouple locations.

25523 **(DOE/SF/70030—T19) Plan for support of large-plant (post-CRBR) needs in large-leak sodium-water reaction area.** Whipple, J.C. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Mar 1980. Contract AT03-76SF70030. 16p. NTIS, PC A02/MF A01. Order Number DE81025232.

Work in the large leak test and analysis area of steam generator development has been carried out at GE-ARSD under 189a SG037 since 1973. The currently planned master schedule for the SG037 program is shown. Principal activities are the large leak testing program being carried out at the Large Leak Test Rig and the analysis methods development. The plan for supporting the large plant (post-CRBR) needs in the large leak sodium-water reaction area is outlined. Most of the needs will be answered in the current SG037 large leak program. (DLC)

25524 **(DOE/SF/71032—T10) Measures of radiological consequences in nuclear-reactor-safety assessments.** Teresi, J.D. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). 1980. Contract AT03-76SF71032. 29p. NTIS, PC A03/MF A01. Order Number DE81025237.

This report presents measures of radiological consequences suitable for use as criteria in reactor safety and design option evaluations. The measures of radiological consequences that are identified and discussed are potential doses (organ or whole body), health effects such as early fatalities, organ cancer fatalities, thyroid nodules, and genetic effects, and property damage). Examples of evaluations presented are: (1) parametric studies of aerosol behavior and transport; (2) evaluation of mitigation approaches; and (3) risk assessments. A discussion of use of an Index of Harm, and of Loss of Life Expectancy as common units for comparing radiological and nonradiological risks is presented as part of an assessment of Total Potential Risk.

25525 **(GEND—001) GEND planning report.** (EG and G Idaho, Inc., Idaho Falls (USA); Allied-General Nuclear Services, Barnwell, SC (USA); Argonne National Lab., IL (USA); Electric Power Research Inst., Palo Alto, CA (USA); Sandia National Labs., Albuquerque, NM (USA)). Oct 1980. Contract AC07-76ID01570. 716p. NTIS, PC A99/MF A01. Order Number DE81025533.

The Three Mile Island (TMI) Unit 2 accident on March 28, 1979 was and is of great concern to the nuclear industry; electric power generating companies and their customers, regulatory and other government agencies, the entire nuclear community, and to the country as a whole. While the accident resulted in only limited external plant radiation exposure, the plant itself suffered extensive damage with high radiation contamination within the reactor and auxiliary system facilities. The GEND Planning Report for cleanup activities at TMI-2 covers the areas of: instrumentation and electrical equipment survivability; fission product transport; decontamination/radiation dose reduction technology; data bank organization and sample archive facility; characterization of primary system pressure boundary and mechanical components; core damage assessment; and fuel handling, removal, examination and disposal.

25526 **(HEDL-SA—2329-FP) Importance theory for lumped-parameter systems.** Cady, K.B.; Kenton, M.A.; Ward, J.C.; Piepho, M.G. (Hanford Engineering Development Lab., Richland, WA (USA); Cornell Univ., Ithaca, NY (USA). Lab. of Nuclear Engineering). 1981. Contract AC14-76FF02170. 8p. (CONF-810606—59). NTIS, PC A02/MF A01. Order Number DE81024107.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

A general sensitivity theory has been developed for nonlinear lumped parameter system simulations. The point of departure is general perturbation theory for nonlinear systems. Importance theory as developed here allows the calculation of the sensitivity of a response function to any physical or design parameter; importance of any equation or term or physical effect in the system model on the response function; variance of the response function caused by the variances and covariances of all physical parameters; and approximate effect on the response function of missing physical phenomena or incorrect parameters.

25527 **(LA-UR—81-1371) Acceptability of reactors in space.** Buden, D. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 10p. (CONF-810812—10). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Reactors are the key to our future expansion into space. However, there has been some confusion in the public as to whether they are a safe and acceptable technology for use in space. The answer to these questions is explored. The US position is that when reactors are the preferred technical choice, that they can be used safely. In fact, it does not appear that reactors add measurably to the risk associated with the Space Transportation System.

25528 **(LA-UR—81-1498) TRAC methods and models.** Mahaffy, J.H.; Liles, D.R.; Bott, T.F. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 20p. (CONF-810806—7). NTIS, PC A02/MF A01.

From Conference on small break loss of coolant accident analysis in LWR's; Monterey, CA, USA (25 Aug 1981).

The numerical methods and physical models used in the Transient Reactor Analysis Code (TRAC) versions PD2 and PF1 are discussed. Particular emphasis is placed on TRAC-PF1, the version specifically designed to analyze small-break loss-of-coolant accidents (LOCAs).

25529 **(LA-UR—81-1519) Special small-break applications with TRAC.** Dobranich, D.; DeMuth, N.S.; Henninger, R.J.; Burns, R.D. III. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 12p. (CONF-810806—3). NTIS, PC A02/MF A01.

From Conference on small break loss of coolant accident analysis in LWR's; Monterey, CA, USA (25 Aug 1981).

Input models for the Transient Reactor Analysis Code (TRAC) are described and applications of these models to reactor transients involving small breaks in the primary coolant pressure boundary are demonstrated. The operation of the primary overpressure protection system (relief and safety valves) and the thermal-hydraulic response of the reactor to these transients are obtained from numerical simulations. Also, the effects of steam generator recirculation, steam generator tube rupture, Emergency Core Cooling (ECC) injection and reactivity feedback on the course and consequences of these transients are investigated. These models allow reliable predictions of accident signatures that can help determine the adequacy of equipment and procedures at nuclear power plants to prevent and to control severe accidents.

25530 **(LA-UR—81-1520) Comparisons of TRAC-PD2 calculations with Semiscale Mod-3 small-break tests.** Gilbert, J.S.; Sahota, M.S.; Boyack, B.E.; Booker, C.P.; Meier, J.K. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 21p. (CONF-810806—4). NTIS, PC A02/MF A01.

From Conference on small break loss of coolant accident analysis in LWR's; Monterey, CA, USA (25 Aug 1981).

Five experiments conducted in the Semiscale Mod-3 facility at the Idaho National Engineering Laboratory (INEL) were calculated using the latest released version of the Transient Reactor Analysis Code (TRAC-PD2). The results were used to assess TRAC-PD2 predictions of thermal-hydraulic phenomena and the effects of pump operation on system response during slow transients. Tests S-SB-P1, S-SB-P2, and S-SB-P7 simulated equivalent 2.5% communicative cold-leg breaks for early pump-trip (pumps-off), intermediate pump-trip (pumps-on), and late pump-trip (pumps-on) operation, respectively. Tests S-SB-P3 and S-SB-P4 simulated equivalent 2.5% communicative hot-leg breaks for pumps-off and pumps-on operation, respectively. Parameters examined in the study included primary system mass distribution, mass inventory, and void fraction distribution.

25531 **(LA-UR—81-1521) TRAC-PD2 modeling of LOFT and PWR small cold-leg breaks.** Knight, T.D.; Willcutt, G.J.E. Jr.; Lime, J.F. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 25p. (CONF-810806—5). NTIS, PC A02/MF A01.

From Conference on small break loss of coolant accident analysis in LWR's; Monterey, CA, USA (25 Aug 1981).

The Transient Reactor Analysis Code (TRAC) is being developed at the Los Alamos National Laboratory to provide advanced best-estimate predictions of postulated accidents in light-water reactors. TRAC-PD2, the latest publicly released version of the code, is currently being tested against small-break and other transients in experimental facilities; it is also being used to analyze postulated accidents in commercial power reactors. Calculated results for LOFT small-break experiments are compared to data, and the results from two small-break calculations for two different reactor systems are presented. It is concluded that TRAC-PD2 is useful for the analysis of cold-leg small-break accidents.

25532 **(LA-UR—81-1556) Pretest and posttest calculations of Semiscale Test S-07-10D with the TRAC computer program.** Duerre, K.H.; Cort, G.E.; Knight, T.D. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 20p. (CONF-810806—6). NTIS, PC A02/MF A01.

From Conference on small break loss of coolant accident analysis in LWR's; Monterey, CA, USA (25 Aug 1981).

The Transient Reactor Analysis Code (TRAC) developed at the Los Alamos National Laboratory was used to predict the behavior of the small-break experiment designated Semiscale S-07-10D. This test simulates a 10 per cent communicative cold-leg break with delayed Emergency Core Coolant injection and blowdown of the broken-loop steam generator secondary. Both pretest calculations that incorporated measured initial conditions and posttest calculations that incorporated measured initial conditions and measured transient boundary conditions were completed. The posttest calculated parameters were generally between those obtained from pretest calculations and those from the test data. The results are strongly dependent on depressurization rate and, hence, on break flow.

25533 **(NUREG—0738) Investigations of reported plant and animal health effects in the Three Mile Island area. Regulatory report.** Gears, G.E.; LaRoche, G.; Cable, J.; Jaroslow, B.; Smith, D. (Nuclear Regulatory Commission, Washington, DC (USA)). Oct 1980. 42p. NTIS, PC A03/MF A01.

The results of investigations into reported problems with plants and animals which may be related to the operation of and accident at the Three Mile Island Nuclear Power Station are presented. The kinds of problems reported are listed, and potential areas of concern (such as the release of radioactive gases and drift from cooling tower plumes) are discussed. Specific case histories are examined, and probable causes attributed. While in some instances not enough data were available for a detailed evaluation to be made, none of the reported problems could be linked to TMI and no general pattern of effects could be seen.

25534 **(NUREG/CR—1492) Qualification testing evaluation program light-water reactor safety research. Quarterly report Jul-Sep 79.** Bonzon, L.L.; Gillen, K.T. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1980. 58p. NTIS, PC A04/MF A01.

The July-September 1979 quarter can be characterized as a period of formal reporting and continuing effort in the Qualification Testing Evaluation (QTE) Program. Under Task 1, the principal effort was devoted to the preparation for continuation of verification tests of the qualification of Browns Ferry Unit 3 connector assemblies. Radiation and thermal-aging experiments were completed last quarter; checkout of the superheat test capability was continued in preparation for the accident-simulation test phase. Under Task 3, effort was directed towards the effects of the sorption characteristics of a material with respect to quantitatively accelerating the degradation. When experiments are properly run and analyzed, Arrhenius behavior is often found. The balance of the quarterly effort centered on continuation of ongoing projects.

25535 **(NUREG/CR—1509) Light water reactor safety research program. Quarterly report Jan-Mar 80.** Berman, M. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1980. 143p. NTIS, PC A07/MF A01.

The Molten Fuel Concrete Interactions (MFCI) study is comprised of experimental and analytical investigations of the chemical and physical phenomena associated with interactions between molten core materials and concrete. Such interactions are possible during hypothetical fuel-melt accidents in light water reactors (LWRs) when molten fuel and steel from the reactor core penetrate the pressure vessel and cascade onto the concrete substructure. The purpose of the MFCI study is to develop an understanding of these interactions suitable for risk assessment. Emphasis is placed on identifying and investigating the dominant interaction phenomena occurring between prototypic materials. The table of contents is the following: Molten fuel concrete interactions study; Steam explosion phenomena; Separate effects tests for TRAP code development; and Containment emergency sump performance.

25536 **(NUREG/CR—1629) In-plant source term measurements at Turkey Point Station - Units 3 and 4. Topical report.** Mandler, J.W.; Croney, S.T.; Dyer, N.C.; McIsaac, C.V.; Stalker, A.C. (Idaho National Engineering Lab., Idaho Falls (USA)). Sep 1980. 608p. NTIS, PC A99/MF A01.

The report presents data obtained at Turkey Point Units No. 3 and No. 4 as a part of the inplant source term measurement program in operating light water reactors (LWR's). The primary objective of this program is to provide the Nuclear Regulatory Commission (NRC) with operational data that can be used in evaluation of plant designs for liquid and gaseous waste treatment systems. Data presented were obtained at the Turkey Point Power Station operated by Florida Power and Light. This plant is the third in a planned series of six operating LWR's to be studied. Data from all plants will be combined and interpreted to provide a data base for radioisotope inventory in plant systems, radioactive waste treatment system performance, and source terms for both liquid and gaseous systems. One of the primary objectives in performing measurements at Turkey Point was to study primary-to-secondary leaks if they occurred and to determine partition factors in steam generators. The opportunity to study primary-to-secondary leaks occurred twice during the in-plant measurement period. Results of these studies together with measurements performed on the liquid and gaseous systems at Turkey Point are presented.

25537 **(SAND—81-0106) Analysis of thermal conductivity probes for high temperature applications.** Koski, J.A. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 52p. NTIS, PC A04/MF A01. Order Number DE81025007.

Various analyses performed to confirm the viability and potential accuracy of a thermal conductivity probe apparatus are sum-

marized and conclusions are presented. The apparatus under consideration was designed for measurements of conductivity of UO_2 powders in inert atmospheres at elevated temperatures to 2300 K in support of the Post Accident Heat Removal (PAHR) program at Sandia. Both analytical solutions and numerical computer models are used for study of the apparatus design. The effects of probe thermal mass and limited sample size on measurement accuracy are analyzed and discussed. Results indicate that the designs considered have the potential for accuracies within 5 percent in the conductivity range of interest (0.1 to 3 W/m-K).

25538 **(SAND—81-0353C) Results of full-scale turbine missile concrete impact experiments.** Woodfin, R.L.; Sliter, G.E. (Sandia National Labs., Albuquerque, NM (USA); Electric Power Research Inst., Palo Alto, CA (USA)). 1981. Contract AC04-76DP00789. 9p. (CONF-810801—12). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Objective was to provide full scale data on the response of reinforced concrete containment walls to impact and penetration by turbine-produced missiles. Four full scale experiments were conducted during the period from December 19, 1979 to June 12, 1980. This paper describes the results of the experiments. Missile velocity was varied from 90 to 132 m/s; missile mass, from 1476 to 2100 kg; missile attitude, to the two extremes of piercing and blunt; and panel liner thickness, from 0 (no liner) to 9.5 mm thickness. The target thickness, reinforcement, and concrete strength were the same in all experiments. Penetration depths into the 1.37 m thick panels ranged from 33 cm for the blunt impact of the 1476 kg missile at 92 m/s to 65 cm for the piercing impact of the 2100 kg missile at 115 m/s. The strongest correlation for penetration was with kinetic energy. Predictions using the modified NDRC penetration formula were moderately conservative, agreeing with measured values to within about 30%. Perforation and scabbing predictions were much less accurate, being extremely conservative. Backface cracking varied greatly from test to test. With the liner absent much superficial cracking was present on the rear face, while the liner seemed to inhibit such cracking. Impact with a sharp missile attitude caused more severe backface cracking than with the blunt attitude. Intensity of shear plug cracking correlated strongly with missile momentum for the same missile attitude. Rear face kinematic quantities showed displacements in excess of 6 cm and velocities in excess of 7 m/s. Attempts to analytically model the impact process have met with limited success using a finite difference code (CSQII) and no success in using finite element codes (NONSAP-C, MARC). 12 figures, 1 table.

25539 **Three Mile Island nuclear accident: lessons and implications.** Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981). 349p. (CONF-8004157—). $66.00.

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Separate abstracts are included for each of the papers presented concerning the background of the Three Mile Island-2 reactor accident; public information and communication; public reactions to the event; and institutional reactions to the event.

25540 **Three Mile Island in perspective: keynote address.** Weinberg, A.M. (Oak Ridge Associated Universities, TN). pp 1-12 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Areas of interest related to nuclear power are discussed concerning requirements for an acceptable nuclear system; the utilities' response to the Three Mile Island-2 reactor accident; the Government's response to the Three Mile Island-2 reactor accident; the adequacy of new measures taken for nuclear power plants; and the necessity of nuclear power plants.

25541 **Safety considerations in the design and operation of light water nuclear power plants.** Lamarsh, J.R. (Polytechnic Inst. of New York, Brooklyn). pp 13-19 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

US nuclear power plants are designed with a sequence of barriers to prevent the escape of fission products. These include the fuel itself, its cladding, a closed cooling system, and a massive containment structure. In addition, nuclear plants are sited away from major population centers so that the affected population can be evacuated if the need arises. While it is highly unlikely, a release of fission products could occur if the core were to melt due to an unintentional lack of cooling. To avoid such occurrences, all nuclear plants are equipped with emergency core cooling systems. The fundamental soundness of this design philosophy has been demonstrated by the, to date, untarnished record of minimal population exposure from all nuclear power plant operations.

25542 **Methods of hazard analysis and nuclear safety engineering.** Rasmussen, N.C. (Massachusetts Inst. of Tech., Cambridge). pp 20-36 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The accident at Three Mile Island has focused considerable attention on the methods of reliability analysis that can provide estimates of the risks associated with hazardous activities. It has become fairly common practice to use the term hazard to refer to the potential for producing some undesired consequence, while the term risk is used to refer to some function of the undesired consequence and its probability of occurrence. The most commonly used function is the simple product of probability and consequence magnitude. Reliability methods are those techniques for identifying system failure modes and estimating their probability of occurrence. The purpose of this paper is to review how these methods have been applied to nuclear power plants and, when combined with calculations of consequences, have been used to make risk estimates of nuclear power plants. The strengths and shortcomings of the study in predicting an accident like Three Mile Island are examined.

25543 **Technical aspects and chronology of the Three Mile Island accident.** Jaffe, L. (National Aeronautics and Space Administration, Washington, DC). pp 37-47 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

With the help of a small, but excellent, group of nuclear experts from the Navy, the Department of Energy, the National Energy Laboratories, and the National Aeronautics and Space Administration and many consultants from industry and the universities, the events leading to the accident, the accident itself, and the response of individuals and organizations to the accident were examined. The sequence-of-events for the Three Mile Island-2 reactor accident is discussed. Possible causes for each event are described.

25544 **Three Mile Island Unit 2: decontamination program.** Arnold, R.C. (Metropolitan Edison Co., Middletown, PA). pp 76-85 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The major activities that must be carried out to accomplish the cleanup of Unit 2 are described. Discussion as to what are the major technical and institutional issues that have to be resolved before the cleanup is accomplished is presented.

25545 **What the president's commission learned about the media.** Rubin, D.M. (New York Univ., NY). pp 95-106 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Three separate news stories appearing during the accident have frequently been criticized as sensational. These three are (1) the NRC press conference on the third day that produced a United Press International (UPI) story on the chance of a meltdown; (2) the CBS Evening News broadcast of the third day, which Walter Cronkite opened by saying, The world has never known a day quite like today; and (3) the Associated Press story on the evening of the fourth day that said the hydrogen bubble in the containment might explode. As a first step in studying more closely the charge of sensationalism, each of these stories will be examined in turn.

25546 **Press and nuclear energy.** Burnham, D. (New York Times, Washington, DC). pp 107-109 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Instances where the media reporters feel that the government and industry have misrepresented information to the public concerning nuclear power are documented.

25547 **Representing the Nuclear Regulatory Commission.** Vollmer, R. (Nuclear Regulatory Commission, Washington, DC). pp 110-113 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Reactions to the Three Mile Island-2 reactor accident by the United States Nuclear Regulatory Commission are summarized.

25548 **Representing the congress.** Myers, H. (House of Representatives, Washington, DC). pp 114-115 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The public information releases concerning the Three Mile Island-2 reactor accident are reviewed as understood by a member of Congress.

25549 **Shared responsibilities of the utility and the media in crisis situations.** Murray, W.B. (General Public Utilities Service Corp., Parsippany, NJ). pp 116-120 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Three Mile Island (TMI) more than any accident in modern history pointed up pertinent lessons for both the media and industry during extended crisis situations. Utilities and the media share a large responsibility in applying these learnings so as to improve public understanding and insure public safety. There are many lessons from TMI for the utility in the pure mechanics of handling the influx of an extremely large number of press and electronic media personnel, as well as the solid stream of telephone inquiries. Utilities with nuclear plants are making the physical changes necessary to alleviate such problems. However, I think it is necessary for the media also to recognize the problems inherent in maintaining all of the niceties desired for ease of good reporting when numbers of media personnel approach 1000 on a continuing basis, and for accident probabilities of low frequency. Nevertheless, nuclear utilities must be prepared to expand rapidly their handling of the off-normal levels of media interest that TMI showed will be generated during the course of a major nuclear accident.

25550 **Representing public interest groups.** Tamplin, A. (Natural Resources Defense Council, Washington, DC). pp 121-122 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

An opinion is presented concerning the performance of the media following the Three Mile Island-2 reactor accident.

25551 **Behavioral and mental health effects of the Three Mile Island accident on nuclear workers: a preliminary report.** Chisholm, R.F. (Pennsylvania State Univ., Middletown); Kasl, S.V.; Dohrenwend, B.P.; Dohrenwend, B.S.; Warheit, G.J.; Goldsteen, R.L.; Goldsteen, K.; Martin, J.L. pp 134-145 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

This study of nuclear workers was conducted by the Task Force on Behavioral Effects of the President's Commission on the Accident at Three Mile Island (TMI). The study was one of four that the task force had conducted to examine effects on the mental health of the public and the workers directly involved in the accident at TMI-2. Determining the behavioral responses of nuclear workers under stress during the accident was of particular interest.

25552 **Local public opinion.** Flynn, C.B. (Social Impact Research, Inc., Seattle, WA). pp 146-158 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Both survey data and interviews with people living close to Three Mile Island (TMI) indicate a substantial variation in response of individuals to the accident. At the extremes, some were virtually oblivious to the potential gravity of the situation and others were traumatized. This variation is, perhaps, one of the most unexpected results of the research that has been conducted in the local area. The attempt to measure and analyze the public response to the TMI accident has relied greatly on public opinion polls. The seven surveys reviewed for this paper were conducted by the Nuclear Regulatory Commission (NRC), the Pennsylvania Department of Health, Smith, Kraybill, Rutgers, Goldsteen, and Brunn. Although the methods used varied, many of the results were similar.

25553 **Stress in the community: a report to the President's Commission on the Accident at Three Mile Island.** Dohrenwend, B.P. (Columbia Univ., New York, NY); Dohrenwend, B.S.; Warheit, G.J.; Bartlett, G.S.; Goldsteen, R.L.; Goldsteen, K.; Martin, J.L. pp 159-174 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The Task Group on Behavioral Effects was created on June 18th and met for the first time as a group on July 2 to 3. The accident at TMI took place between March 28 and April 10. Fortunately, during or shortly after the accident, on their own, several researchers from colleges and universities near the TMI site began sample surveys of the approximately 744,000 people living within 20 miles of TMI. Most of these studies employed reliable measures of psychological effects with small, but carefully drawn, samples of the general population or of high-risk groups, such as mothers of preschool children within the general population. These studies provided the basis for identifying the immediate and short-term behavioral effects of the accident on the general population and several important groups within it.

25554 **Three Mile Island: a resident's perspective.** Trunk, A.D.; Trunk, E.V. pp 175-185 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

A resident of Middletown, Penn., can be classified either as being too close to the forest to see the trees, or as being close enough to an historical event to see details that others miss. This paper presents the perspective of a family that lived within the critical five-mile region of Three Mile Island (TMI). The family is unique perhaps in that it had lived in Middletown for 10 years (long enough to witness the construction phases of both Units 1 and 2). Also, the family's head is a mechanical engineering teacher who comprehends the terminology of the industry. Finally, the family has a preschool child but remained in the area until the crisis was officially over. Each of these factors played its role in developing a reliable source of news and in making possible the best interpretation under the circumstances. The six-month period of service on the presidential commission following the accident provided access to a wide range of information that the typical resident never will see. Therefore, the authors were afforded a unique insight into all events surrounding the accident.

25555 **Pregnant pause: the European response to the Three Mile Island accident.** Nelkin, D.; Pollak, M. (Cornell Univ., Ithaca, NY). pp 186-195 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The accident intervened in an ongoing debate over nuclear power in Western Europe, but a debate that was far more intense and more immediate in some countries than in others. The reaction to the accident in each country varied, depending on the stage of internal controversy over nuclear technology at the time. Interpretations of the problems revealed by the accident also varied depending on the political and administrative issues that were most salient to protagonists in the specific policy context. This paper analyzes the influence of the Three Mile Island accident on the European nuclear debate, as it followed from the political and institutional factors that shaped national policies toward nuclear power and its opposition.

25556 **Response of the Nuclear Regulatory Commission to the accident at Three Mile Island.** Budnitz, R.J. (Nuclear Regulatory Commission, Washington, DC). pp 203-209 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Potential technical and institutional flaws observed by the US NRC concerning present nuclear power plants are discussed. The flaws include: safety design; human factors; emphasis on hardware; siting policy; instrumentation and control inadequacies; complacency; concern with regulation rather than safety; poor feedback of operating experience; lack of self-policing; disincentives to safety improvements; and inadequate emergency response.

25557 **Reaction of Congress to the accident at Three Mile Island.** Leventhal, P. pp 210-215 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The overall congressional reaction to Three Mile Island is one of caution, hesitation, and continued sensitivity to code words, particularly moratorium and antinuclear. In the wake of Three Mile Island, Congress is by no means antinuclear, but it is surely less pronuclear - or at least complacent nuclear - than it had been prior to the accident and during the period of the Joint Committee on Atomic Energy. There is growing interest in conservation and in the leading energy alternatives, specifically solar energy and synthetic fuels. There is a need for Congress to oversee closely the ongoing recovery operation. There are a lot of potential problems there that do bear close scrutiny.

25558 **Three Mile Island and the scientific community.** Mazur, A. (Syracuse Univ., NY). pp 216-221 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The immediate response to Three Mile Island (TMI) among the general public was one of increased awareness of the problems of nuclear power and increased opposition to it. The response of scientists and engineers might be expected to differ from that of the general public. Technical people are more likely than are laymen to understand the technical issues involved in the accident, and they probably were more interested in the general topic of energy before the accident. The problems of nuclear power have been discussed fairly well in the technical community for some time, and opinions for or against atomic energy seem to have been set before the accident so there may not have been a great shift in opinion afterward. In order to explore this topic with the limited resources at hand, the opinions of several prominent scientists who had taken public positions for or against nuclear power well before TMI are presented.

25559 **Reaction of the nuclear industry to the Three Mile Island accident.** Szalay, R.A. (Atomic Industrial Forum, Inc., Washington, DC). pp 222-229 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The accident at Three Mile Island (TMI) firmly established a working premise for the future - the ultimate responsibility for the safety of nuclear power plants belongs to their operators and managers. With the full support and resources of the nuclear industry behind them, utility owner/operators have recognized and accepted that responsibility. This enhanced management awareness, though not directly quantifiable, may have been the accident's most positive contribution. Correspondingly, industry and government studies resulting from TMI have reached similar conclusions: the design of nuclear plants is fundamentally sound, but changes should be made in the organization, procedures, and attitudes of the institutions responsible for nuclear safety. These studies showed no inherent problems in nuclear plants that make them unacceptable from a safety standpoint, but did demonstrate weaknesses in information processing, operator training and procedures, and certain aspects of the safety review process. Over the last year, the industry has worked to correct these problems.

25560 **Reassessing the nuclear option: Three Mile Island from a state perspective.** Varanini, E.E. III. (California Energy Commission, Sacramento). pp 230-243 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The implications of TMI for state government are manifest; state roles will never be the same again. States can be expected to expand their jurisdiction in all areas of energy planning, especially those areas that directly affect the health and safety of citizens. The discussion covers six general issues: (1) need for power, (2) supply planning, (3) economics, (4) alternatives, (5) land use policy and power plant siting, and (6) emergency planning. Together, these issues provide a comprehensive discussion of state interests resulting from the accident at TMI. Additional sections on state authority and potential problems in state-federal relationships discuss issues that may become important in the near future.

25561 **Public interest groups.** Wolf, C.P. (Polytechnic Inst. of New York, Brooklyn). pp 244-256 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The topic of public interest groups raises some awkward, but essential, questions not only for nuclear development and regulation but for democratic governance in technological society as a whole. What public concerns were aroused by the accident at Three Mile Island (TMI). What is the legitimacy of such concerns. How can they be usefully addressed and expressed. The awkwardness comes in trying to identify the public interest and in structuring meaningful public involvement in relation to public concerns. Answers to these questions are presented.

25562 **Reaction of the regulatory agency as viewed from the perspective of the public interest organization.** Johnsrud, J. (Environmental Coalition on Nuclear Power, State College, PA). pp 257-262 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The topic of interest is institutional reactions to the Three Mile Island accident as a specific aspect of the societal reaction to the event. The Nuclear Regulatory Commission's (NRC) relationship to the public is analyzed.

25563 **Accident at Three Mile Island and the problem of uncertainty.** Marrett, C.B. (Univ. of Wisconsin, Madison). pp 280-291 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Lessons about TMI that the commissioners themselves learned are presented. Of particular interest are the problems found to be associated with the search for clarity and certainty in the midst of incomplete information. The efforts to create certainty came from all sides - from the public and their representatives who wanted to know not simply the status of the plant but also the actions they should follow; from utility, governmental, and other analysts who sometimes offered statements on the basis of insufficient or controversial data. The commission chronicled communication difficulties and drew some conclusions about ways in which information could be transmitted better than it was at Three Mile Island. The likelihood that a polarized political environment made the handling of uncertainty even more problematic than would have been the case had the hazard been of another type is discussed.

25564 **Three Mile Island nuclear accident: the other lesson.** Starr, C. (Electric Power Research Inst., Palo Alto, CA). pp 292-310 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

The lessons learned from the Three Mile Island (TMI) accident from the standpoint of the utility industry are discussed. TMI highlighted organizational and engineering weaknesses in the nuclear power operations - weaknesses that clearly called for remedies. Steps taken to remove the weaknesses are described.

25565 **Lessons of Three Mile Island for the institutional management and regulation of nuclear power.** Green, H.P. (Fried, Frank, Harris, Shriver & Kampelman, Washington, DC). pp 311-315 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

Licensing and regulatory changes needed in view of the Three Mile Island-2 reactor accident are discussed.

25566 **Commonwealth of Pennsylvania emergency preparedness and response: the Three Mile Island incident.** Henderson, O.K. (Pennsylvania Emergency Management Agency, Harrisburg). pp 316-322 of Three Mile Island nuclear accident: lessons and implications. Moss, T.H.; Sills, D.L. (eds.). New York, NY; New York Academy of Sciences (1981).

From Conference on the Three Mile Island nuclear accident; New York, NY, USA (8 Apr 1980).

This paper discusses the Commonwealth of Pennsylvania's emergency response mechanism and legal basis in being at the time of the Three Mile Island incident. It recounts the sequence of events as they directly affected the agency and the methods whereby the agency discharged its responsibilities. Finally, some of the problems and experiences accruing from Three Mile Island are listed as lessons learned.

25567 **Permeation cascades for the separation of krypton and xenon from nuclear reactor atmospheres.** Stern, S.A.; Wang, S.C. (Syracuse Univ, NY). *AIChE (American Institute of Chemical Engineers) Journal ;* **26**: No. 6, 891-901(Nov 1980).

Multistage permeation cascades have been designed for the removal of radioactive krypton and xenon from nuclear reactor atmospheres. These cascades could serve for the decontamination of the atmosphere within a reactor containment dome following a nuclear accident and for other applications of interest to the nuclear industry. The stages of the cascades are assumed to consist of permeator modules using silicon rubber capillaries as separation membranes. All stages are to be operated in a countercurrent mode with shell-side feed. It is shown that it is possible to design an ideal cascade for the separation of multicomponent mixtures by matching the concentrations of a suitable key component in interstage streams that are mixed. This procedure minimizes the cascade volume and power requirement. 25 refs.

25 ENERGY STORAGE

REFER ALSO TO CITATION(S) 25216, 25616, 25881

2501 Magnetic

REFER ALSO TO CITATION(S) 26695

2502 Compressed Gas

REFER ALSO TO CITATION(S) 25213, 25576, 26407

25568 **(EPRI-EM—1589(Vol.6)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 6. Site investigation: shallow drilling. Final report.** (Potomac Electric Power Co., Washington, DC (USA); Acres American, Inc., Buffalo, NY). Apr 1981. Contract AC02-77ET28013. 202p. NTIS, PC A10/MF A01. Order Number DE81025111.

This volume presents the results of the shallow drilling program performed on the Sunshine Site from November to December 1979. The work was undertaken to define the surficial geological conditions and the nature of the overburden and the bedrock at shallow depths as part of the field exploration program for underground pumped hydro (UPH) and compressed air energy storage (CAES) facility. Testing was performed on selected rock and soil samples to define the physical and mechanical properties of the subsurface material. Piezometers were installed on the site for long-term monitoring of the groundwater. Further deep-hole exploratory work is described in Volume VII of this series.

25569 **(EPRI-EM—1589(Vol.7)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 7. Site investigation: deep drilling. Final report.** (Potomac Electric Power Co., Washington, DC (USA); Acres American, Inc., Buffalo, NY). Apr 1981. Contract AC02-77ET28013. 250p. NTIS, PC A11/MF A01. Order Number DE81025264.

This volume presents the results of the deep drilling program performed on the Sunshine Site from January to August 1979. The work was undertaken to drill a deep hole and to perform in-hole testing to determine the suitability of the Sykesville Formation for underground pumped hydro (UPH) and compressed air energy storage (CAES) facility. The work included continuous core drilling and sampling of the Sykesville to a vertical depth of 2556 ft, in-hole geophysical logging, determination of rock permeability and stresses, and rock testing.

25570 **(EPRI-EM—1589(Vol.9)(App.B)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix B. Champagne effect. Final report.** (Potomac Electric Power Co., Washington, DC (USA); Acres American, Inc., Buffalo, NY). Apr 1981. Contract AC02-77ET28013. 126p. NTIS, PC A07/MF A01. Order Number DE81025108.

This appendix documents the work performed during the study to investigate the significance of the release of dissolved air from the water in the water shaft during air compression on the design and operation of a hydraulically compensated CAES plant. This air release phenomena has been named the Champagne Effect. Included is a description of the work performed by Dr. Mollendorf to investigate the rate of diffusion of air into water, the rate of the subsequent release of air from the water during passage up the water shaft, and an evaluation of the resulting behavior of the air bubbles in the shaft. Also included is a discussion of the dynamic modeling performed by Rowe and Associates under a separate contract to DOE. This simulation was based upon a two-fluid model of the PEPCo system and includes an analysis of potential modifications to the design that might further mitigate any operation problems.

25571 **(EPRI-EM—1589(Vol.9)(App.E)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix E. Electrical systems. Final report.** (Potomac Electric Power Co., Washington, DC (USA); Acres American, Inc., Buffalo, NY). Apr 1981. Contract AC02-77ET28013. 149p. NTIS, PC A07/MF A01. Order Number DE81025262.

This appendix documents the development of the Task 3 design approaches for the electrical systems for a hydraulically-compensated, hard-rock mined cavern, Compressed Air Energy Storage (CAES) facility. The design approaches presented herein provided the basis for development of the preliminary plant design presented in Volume 12. The electrical systems described in this appendix include the plant power system, switchyard and electrical motor starting system. The design approaches presented in this appendix are based on the design criteria presented in the Project Design Criteria - CAES, Volume 3. Selection of the preferred approach reflect the Task 3 study results and conform to the greatest extent possible with PEPCo's standard practices.

25572 **(PNL—3470) Water coning in porous media reservoirs for compressed air energy storage.** Wiles, L.E.; McCann, R.A. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 121p. NTIS, PC A06/MF A01. Order Number DE81025774.

The general purpose of this work is to define the hydrodynamic and thermodynamic response of a CAES porous media reservoir subjected to simulated air mass cycling. This research will assist in providing design guidelines for the efficient and stable operation of the air storage reservoir. This report presents the analysis and results for the two-phase (air-water), two-dimensional, numerical modeling of CAES porous media reservoirs. The effects of capillary pressure and relative permeability were included. The fluids were considered to be immisicible; there was no phase change; and the system was isothermal. The specific purpose of this analysis was to evaluate the reservoir parameters that were believed to be important to water coning. This phenomenon may occur in reservoirs in which water underlies the air storage zone. It involves the possible intrusion of water into the wellbore or near-wellbore region. The water movement is in response to pressure gradients created during a reservoir discharge cycle. Potential adverse effects due to this water movement are associated with the pressure response of the reservoir and the geochemical stability of the near-wellbore region. The results obtained for the simulated operation of a CAES reservoir suggest that water coning should not be a severe problem, due to the slow response of the water to the pressure gradients and the relatively short duration in which those gradients exist. However, water coning will depend on site-specific conditions, particularly the fluid distributions following bubble development, and, therefore, a water coning analysis should be included as part of site evaluation.

25573 **(PNL—3804) Compressed air energy storage technology program. Annual report for 1980.** Kannberg, L.D. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 201p. NTIS, PC A10/MF A01. Order Number DE81024405.

All of the major research funded under the Compressed Air Energy Storage Technology Program during the period March 1980 to March 1981 is described. This annual report is divided into two segments: Reservoir Stability Studies and Second-Generation Concepts Studies. The first represents research performed to establish stability criteria for CAES reservoirs while the second reports progress on research performed on second-generation CAES concepts. The report consists of project reports authored by research engineers and scientists from PNL and numerous subcontractors including universities, architect-engineering, and other private firms.

2503 Pumped Hydro

REFER ALSO TO CITATION(S) 25210, 25213, 25568, 25569, 26407

25574 **(EPRI-EM—1589(Vol.8)(App.A)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix A. Upper reservoir. Final report.** (Potomac Electric Power Co., Washington, DC (USA); Acres American, Inc., Buffalo, NY). Apr 1981. Contract AC02-77ET28013. 91p. NTIS, PC A05/MF A01. Order Number DE81025112.

This appendix documents studies undertaken to determine the preferred arrangement of the upper reservoir and its associated surface facilities for an underground pumped hydroelectric (UPH) facility. Overriding considerations including operating range, volume and lining of reservoir, embankment design, intake/outlet arrangements and filling and make-up water provisions were studied within the context of minimizing facility costs and optimizing the plant layout. The study led to the selection of a reservoir formed by an embankment of compacted rockfill together with an intake/outlet structure located in the embankment. The reservoir floor and upstream slopes of the embankment will have an asphalt lining to prevent leakage. The material and cost estimates presented are based on the requirements for a 2000 MW plant providing 20,000 MWh of storage with a nominal head of 4600 ft. Studies subsequently carried out, including head optimization analyses for the overall UPH surface and underground configuration and further refinement of selected designs (see Volume 8, Design Approaches, UPH), may have modified some of the material given in this appendix. The finally adopted arrangement is described in Volume 11, Plant Design, UPH.

25575 **(EPRI-EM—1589(Vol.8)(App.E)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix E. Lower reservoir. Final report.** (Potomac Electric Power Co., Washington, DC (USA); Acres American, Inc., Buffalo, NY). Apr 1981. Contract AC02-77ET28013. 157p. NTIS, PC A08/MF A01. Order Number DE81025127.

This appendix documents studies undertaken to determine the requirements for and the preliminary design of the lower (underground) reservoir for an underground pumped hydroelectric (UPH) facility. Operational, construction, and geotechnical requirements were examined. Overriding considerations including operating range, volume, construction methods, cavern cross section and reservoir layout were studied within the context of minimizing facility costs and optimizing the plant layout. The study led to a preliminary arrangement of fourteen parallel caverns each 60 ft wide by 85 ft high in cross section and 3610 ft in length. The requirements for and preliminary design of the intermediate reservoir in the case of a two-step UPH facility is also described. The design and the cost estimates presented in this appendix are based on the requirements for a 2000 MW plant providing 20,000 MWh of storage at a nominal head of 4600 ft. Studies subsequently carried out, including head optimization analyses for the overall UPH surface and underground configuration and further refinement of selected designs (see Volume 8, Design Approaches, UPH) have modified

some of the material given in this appendix. The finally recommended arrangement is described in Volume 11, Plant Design, UPH.

25576 **(EPRI-EM—1589(Vol.10)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 10. Environmental studies. Final report.** (Potomac Electric Power Co., Washington, DC (USA); NUS Corp., Rockville, MD (USA)). Apr 1981. Contract AC02-77ET28013. 351p. NTIS, PC A16/MF A01. Order Number DE81025107.

Results of preliminary environmental assessments for a proposed UPH or CAES demonstration facility are presented. Included are characterizations of the existing environment of the Sunshine Site in Montgomery County, Maryland, and assessments of environmental impacts and public safety concerns. Elements of the existing environment which are considered sensitive are described. Environmental impacts are identified, rated, and described for both alternative demonstration facilities. The impacts identified for UPH which may be considered to have high significance are alteration and/or loss of Prime Farmland and Farmland of Statewide Importance, changes in existing land use, conflict with present surrounding land use, and change in existing and planned zoning. The impacts for CAES which may be considered to have high significance are the same as UPH but also include impact on air quality from turbine exhaust NO/sub x/ emissions and an increase in noise levels from compressor air inlet and cooling tower operation. Mitigating measures are recommended for these and other impacts of less significance. Public safety concerns for both alternative demonstration facilities are also identified and discussed. These include, for both UPH and CAES, underground cavern collapse and surface subsidence, explosives, site security, icing, upper reservoir failure, and mechanical failure of plant equipment. In addition, fuel handling and the champagne effect are addressed for CAES.

2505 Flywheels

25577 (CONF-790203—, pp 12p, Paper 41) **Study of flywheel energy storage system for electric utilities.** Shimamura, S.; Matsuno, K.; Noguchi, Y.; Tsutsui, Y. (AIST, Tokyo, Japan). 1979. NTIS (US Sales Only), PC A25/MF A01.

From Solar energy symposium; Tokyo, Japan (5 Feb 1979).

The study of stationary flywheel energy storage system for electric utilities, etc., now being carried on at Mechanical Engineering Laboratory (MEL) as a part of the national R and D project called Sunshine Project, is outlined. Discussions based on theoretical analyses and some experimental results are made as for the material, the shape and the fabrication method of the flywheel. Experimental devices such as the flywheel performance testing machine, the fiber composite (FRP) flywheel molding machine, etc. set up at MEL are also shown.

25578 **(DOE/ET/20279—130) Testing and evaluation of a solar photovoltaic flywheel energy storage system.** Jarvinen, P.O.; Brench, B.L.; Hay, R.D.; Rasmussen, N.E. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 1981. Contract AC02-76ET20279. 6p. (CONF-810812—4). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A thorough series of experimental measurements are reported that have been made on a 1/10-scale, magnetically levitated, residential solar photovoltaic (PV) flywheel energy storage system which acts as a complete interface between a solar PV array and an ac load. The overall in-out electrical storage efficiency of the flywheel unit was measured along with the power-transfer efficiencies of individual components and the system spin-down tare losses. An overall storage efficiency of 82% was measured for the flywheel storage system when operated in a utility-interactive mode.

2506 Thermal

REFER ALSO TO CITATION(S) 25298, 25308, 25389, 25390, 25765, 25766

25579 **(DOE/NASA/0138—1) Extended development of a sodium hydroxide thermal-energy storage module.** Rice, R.E.; Rowny, P.E; Cohen, B.M. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center; Comstock and Wescott, Inc., Cambridge, MA (USA)). Sep 1980. Contract AI01-77ET26945. 223p. (NASA-CR—165206). NTIS, PC A10/MF A01. Order Number DE81025248.

Development of a phase-change thermal storage system (TESS) using modified anhydrous sodium hydroxide and a single, passive, tube-intensive heat exchanger, for charging and discharging heat at approximately 584 K by a non-phase-change heat transfer liquid, Therminol-66 continued. The three parts of the present program were (1) chemical analyses on the storage medium and examination of its heat exchanger, (2) production of additional experimental data using a different non-phase change heat transfer fluid (Caloria HT-43) to extend the validation of a computer model of the TESS, and (3) development of a new computer model of a TESS containing an additional heat exchanger for the vaporization and superheating of a power fluid for a Rankine cycle power generator, and the use of the model to develop a cost optimized reference TESS design for comparison with the single heat exchanger TESS design. From the prior experimental work it was concluded that no chemical degradation of the medium occurred, but some physical segregation of components, which can be reversed by fully remelting the medium, was observed. No significant deterioration of the heat exchanger was found. A computer model was successfully developed which provides for 3-way heat transfer, between each fluid and the medium, and directly between the two fluids. The reference design of the 2-heat exchanger TESS improved thermal performance, capital cost, and overall system operating cost.

25580 **(SAND—81-8225) Thermal energy storage for solar thermal applications program. Progress report, April 1980-March 1981.** Radosevich, L.G. (Sandia National Labs., Livermore, CA (USA)). May 1981. Contract AC04-76DP00789. 106p. NTIS, PC A06/MF A01. Order Number DE81025219.

This report summarizes the progress made by the Thermal Energy Storage for Solar Thermal Applications (TESSTA) Program in the period April 1980 to March 1981.

2508 Chemical

REFER ALSO TO CITATION(S) 25248

2509 Batteries

REFER ALSO TO CITATION(S) 25389, 25878

25581 **(AD-A—090346) The charge and discharge behavior of molybdenum trioxide electrodes in lithium perchlorate-propylene carbonate electrolyte. Technical report.** Hunger, H.F.; Ellison, J.E. (Army Electronics Research and Development Command, Fort Monmouth, NJ (USA). Electronics Technology/Devices Lab.). Jul 1980. 23p. NTIS, PC A02/MF A01.

The anodic and cathodic behavior of molybdenum trioxide electrodes in various states of lithiation was investigated in 1M $LiClO_4$-PC electrolytes at room temperature. A comparison was made between the anodic and cathodic rate capabilities of the electrodes. From cycling experiments at various depths of discharge, cycle life data were obtained. Problems observed after deep discharges are discussed.

25582 **(AD-A—090785) Testing of lithium-sulfur dioxide cells for waste disposal hazards. Final report sep 79-mar 80.** Boies, D.B. (Wapora, Inc., Washington, DC (USA)). Oct 1980. Contract DAAK20-79-C-0285. 27p. NTIS, PC A03/MF A01.

Lithium-sulfur dioxide cells have been examined to determine if they are considered hazardous wastes under Section 250.13

of the proposed amendment of 40 CFR, Part 250, as published in the Federal Register, Vol. 43, No. 243, 18 December 1978. Fresh and discharged samples of cells have been tested. The cells are not hazardous for disposal if the case is not ruptured. On the basis of the Structural Integrity Procedure of the proposed rules, the cells will not rupture, and thus will not be considered hazardous. If the cell case should be ruptured in some manner, a small amount (approximately 2 to 12 grams/cell) of sulfur dioxide will be released. This is an irritant, odorous, and toxic gas; the degree of hazard will depend on the number of cells ruptured at a time, meteorological conditions, the distance to sensitive receptors, etc.

25583 (ANL/OEPM—80-8) Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells. Final report. (Argonne National Lab., IL (USA)). Aug 1980. Contract W-31-109-ENG-38. 76p. NTIS, PC A05/MF A01.

A prototype hydrogen-oxygen gas recombination device (HORD) was fabricated. The 435-W HORD was tested for performance and gas recombination efficiency using cyclinder H_2 and O_2 gases at various ratios and at various gas flow rates; high (100%) recombination efficiencies were obtained at all conditions tested. Temperature profiles of the HORD showed an even temperature distribution with no hot spots. The pressure was found to be dependent on the presence of surplus gases. Higher outside temperatures had a negligible effect on performance. The stibine-arsine removal device was found to be very effective; removal efficiencies may be decreased if water vapor condenses on the activated charcoal. The HORD was also tested with a lead-acid cell over a cycle simulating a typical utility load-leveling application. The system operated gas-tight and maintenance-free. Water loss over a 10-y lifetime of such a system is estimated to be only <1 L. A flame arrester was tested and found to be effective, but more work is needed before it can be used in the cell/HORD system. Other safety appliances are discussed for cases of high and low explosive gas concentrations inside the HORD. More work is advised in this area. A theoretical model of HORD operation is presented. More detailed analyses of released gases are needed to obtain information to substantiate the model. To date, the HORD has been operated for 1500 h and no malfunction or decrease in efficiency has been monitored.

25584 (CONF-800612—6) Status of nickel/zinc and nickel/iron battery technology for electric vehicle applications. Yao, N.P.; Christianson, C.C.; Elliott, R.C.; Miller, J.F. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 43p. NTIS, PC A03/MF A01. Order Number DE81023572.

From 29. power sources conference; Atlantic City, NJ, USA (9 Jun 1980).

Significant progress in nickel/zinc and nickel/iron technology has been made towards achieving the battery technical performance goals necessary for widespread use of these battery systems in electric vehicle applications. This progress is reviewed. Nickel/zinc module test data have shown a specific energy of nearly 70 Whr/kg and a specific power of 130 W/kg. However, cycle life improvements are still needed (presently demonstrated capability of 120 cycles) and are expected to be demonstrated during 1980. Nickel/iron modules have demonstrated a specific energy of nearly 50 Wh/kg and a specific power of 100 W/kg. Indications are that improved performance in these areas can be shown during 1980. Nickel/iron modules cycle lives of 300 have been achieved during early 1980 and testing continues. Energy efficiency has been improved from less than 50% to over 65%. Cost reduction (both initial and operating) continues to receive major emphasis at developers of both nickel/zinc and nickel/iron batteries in order to achieve the lowest possible life cycle cost to the battery user.

25585 (CONF-800806—46) Recent progress in lithium/iron sulfide battery development. Barney, D.L.; Steunenberg, R.K.; Chilenskas, A.A. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 28p. NTIS, PC A03/MF A01. Order Number DE81023127.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

A joint effort by Argonne National Laboratory ANL and industrial subcontractors aimed at the development of high-temperature lithium/iron sulfide batteries for electric-vehicle propulsion and stationary energy storage is described. The battery cells have lithium-alloy (Li-Al or Li-Si) negative electrodes, iron sulfides (FeS or FeS_2) positive electrodes, and molten LiCl-KCl electrolyte. A 40 kW-hr electric vehicle battery, designated as Mark IA, was fabricated in 1979. During startup heating prior to electrical testing, a short circuit developed in one of the modules, causing a progressive failure of all the cells in the module. In the subsequent Mark II program, various improvements are being made in the cells and battery hardware to eliminate the potential failure mechanisms. In the cell development effort, multiplate cells having as many as three positive and four negative electrodes have been fabricated and tested successfully. In the battery development area, work is in progress on thin, high-efficiency thermal insulation to be used in the battery containment vessel. A charger-equilizer concept was developed, in which the major portion of the charge is added to the battery as a whole, and then the individual cells are charged to a predetermined cutoff voltage. A charging system that incorporates this concept has been tested.

25586 (CONF-810315—13) Near-term batteries for electric vehicles. Christianson, C.C.; Yao, N.P.; Hornstra, F. (Argonne National Lab., IL (USA)). 1981. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023543.

From 8. energy technology conference and exposition; Washington, DC, USA (9 Mar 1981).

Major progress has been achieved in the lead-acid , nickel/iron and nickel/zinc battery technology development since the initiation of the Near-Term eV Battery Project in 1978. Against the specific energy goal of 56 wh/kg the demonstrated specific energies are 41 wh/kg for the improved lead-acid batteries, 48 wh/kg for the improved nickel/iron batteries, and 68 wh/kg for the improved nickel/zinc batteries. These specific energy values would allow an ETV-1 vehicle to have an urban range of 80 miles in the case of the improved lead-acid batteries, 96 miles for the improved nickel/zinc batteries, and 138 miles for the improved lead-acid batteries. All represent a significant improvement over the state-of-the-art lead-acid battery capability of about 30 wh/kg with approximately a 51 mile urban range for the ETV-1 vehicle. The project goal for specific power of 104 w/kg for 30 seconds at a 50% depth of discharge has been achieved for all of the technologies with the improved lead-acid demonstrating 111 w/kg, the improved nickel/iron demonstrating 103 w/kg, and the improved nickel/zinc demonstrating 131 w/kg. Again this is a significant improvement over the state-of-the-art lead-acid battery capability of 70 w/kg. Substantial progress has been made against the life cycle goal of 800 cycles as evidenced by the demonstrated lead-acid battery achievement of $>$ 295 cycles in ongoing tests, the nickel/iron demonstrated capability of $>$ 515 cycles in ongoing tests, and the nickel/zinc demonstrated capability of 179 cycles. Except for the nickel/zinc batteries, the demonstrated cycle life is better than the state-of-the-art lead-acid battery cycle life of about 250 cycles. Future program emphases will be on improving cycle life and further reductions in cost.

25587 (CONF-8010159—11) Phase relationships in positive electrodes of high-temperature lithium aluminum/iron sulfide cells. Tomczuk, Z.; Roche, M.F.; Vissers, D.R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 14p. NTIS, PC A02/MF A01. Order Number DE81023816.

From Fall meeting of the Electrochemical Society; Hollywood, FL, USA (5 Oct 1980).

The phases present in FeS and FeS_2 positive electrodes of lithium aluminum/iron sulfide cells were determined by x-ray diffraction and by metallographic examinations. The phases found in FeS electrodes were FeS, J($=LiK_6Fe_{24}S_{26}Cl$), Li_2FeS_2, Li_2S, and Fe. The phases found in FeS_2 electrodes were FeS_2, $KFeS_2$, $Li_3Fe_2S_4$, Y phase ($\sim Li_7Fe_2S_6$), Fe/sub 1-x/S, J, Li_2S, and Fe. In the absence of potassium-containing phases, the electrode phases are in accord with the Li-Fe-S phase diagram.

25588 (LBL—12657) Performance of sodium-beta alumina solid electrolyte in Na/S cells. De Jonghe, L.C. (Lawrence Berkeley Lab., CA (USA); California Univ., Berkeley (USA). Dept. of Materials Science and Mineral Engineering). May 1981. Contract W-7405-ENG-48. 5p. (CONF-810812—18). NTIS, PC A02/MF A01. Order Number DE81023030.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The performance of sodium-beta alumina type solid electrolytes is limited by degradation. Two different modes of degradation are discussed. Mode I involves the well studied current focusing on a pre-existing surface flaw; Mode II involves internal sodium precipitation and possible microfracture. The second mode can be activated when a gradient in transport number ratios has been created by chemical reduction of the electrolyte by the sodium electrode. The implications of the degradation for cell operation are discussed.

25589 **(SAND—81-0226C) Testing batteries for photovoltaic power systems.** Verardo, A.E.; Butler, P.C.; Bush, D.M.; Miller, D.w. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 10p. (CONF-810812—6). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A Battery Evaluation Laboratory has been established at Sandia National Laboratories to investigate the application of various battery technologies for energy storage in a Photovoltaic Power System. This laboratory is part of the DOE-sponsored Battery Storage for Solar Applications Program which is being managed by Sandia National Laboratories. The Evaluation Laboratory has been designed to provide a controlled test environment in which batteries can be exposed to any one or all of the following: (1) long-term performance testing; (2) accelerated life testing; (3) simulated photovoltaic power system operational testing. To meet the diversity of the requirements for each of these tests and to accommodate variations in battery system performance parameters, a sophisticated computer controlled test system has been developed. At the present time, several battery systems are under test. These battery systems include: (1) various types of commercially available lead acid batteries; (2) advanced design deep-discharge sealed lead acid batteries; (3) a zinc-bromine flowing electrolyte battery developed by Exxon; and (4) an iron-Chromium Chloride Redox flowing electrolyte battery developed by NASA Lew Research Center. A description is presented of the Laboratory and the tests currently being conducted as well as a brief description of the battery systems under test.

29 ENERGY PLANNING AND POLICY

REFER ALSO TO CITATION(S) 25850

25590 **(DOE/EIA/11096—T1) Data collection and analysis. Part 1. Automated data collection process. Part 2. Data elements and reports.** (Rehab Group, Inc., Falls Church, VA (USA)). May 1981. Contract AC01-81EI11096. 102p. NTIS, PC A06/MF A01.

The objective of this report is to document the data collection and analysis techniques utilized in compiling the automated inventory of program and data files, and to present the results of the automated inventory as part of the EIA software conversion study. This document is provided in two parts. Part 1 provides a dscription of the automated data cllection process - the collection methodology, the automated procedure constraints and the validation methodology, and a summary of inventory results. Part II provides detailed reports containing all conversion data elements obtained in the automated process.

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 24971, 25038, 25066, 25350, 25639, 25716, 25717

25591 **(DOE/CS/10046—2(Vol.1)) State energy modeling. Volume I. An analysis of state energy modeling.** Melcher, A.G. (Colorado School of Mines, Golden (USA). Research Inst.). 30 May 1981. Contract AC02-79CS10046. 85p. NTIS, PC A05/MF A01.

An inventory and analysis of state energy models was made. This report discusses the types of models, uses of models in decisions, brief illustrations of various models, and the general process of state modeling. The inventory identified 69 models that have been developed or used at the state government level. Most of these deal with energy demand and area mix as regards the sectors modeled and the fuel types included. Nearly all of these are econometric or econometric-engineering end-use models. Fewer models deal with energy supply, and several address both supply and demand. A few states have comprehensive libraries of models, and several states have models for emergency energy management. State models address a wide range of energy issues. The single issue that has caused the most modeling is electric generation capacity expansion. Most conservation and alternative energy issues are subsumed in the electricity question. The most common types of models are econometric, engineering end use, linear programming, and input-output. Most modeling involves a mixture of mathematical types. Purposes of models include: forecasting, policy analysis, impact analysis, and scenario analysis. Uses include short-term emergency management, long-term strategic assessment, and specific applications in decisions on facility siting, utility capacity expansion and rate increases proposed legislation, and analysis of federal policy. The report presents illustrations of models from various states and discusses key factors in the process of modeling, such as personnel, cost-effectiveness, regional modeling transferring models, and uses in decision making.

25592 **(DOE/CS/10046—2(Vol.2)) Energy modeling. Volume II. Inventory and details of state energy models.** (Colorado School of Mines, Golden (USA)). 30 May 1981. Contract AC02-70CS10046. 295p. NTIS, PC A13/MF A01.

An inventory of energy models developed by or for state governments is presented in this report, and certain models are discussed in depth. These models address a variety of purposes such as: supply or demand of energy or of certain types of energy; emergency management of energy; and energy economics. Ten models are described at some length. The purpose, use, and history of the model is discussed, and information is given on the outputs, inputs, and mathematical structure of the model. The models include five models dealing with energy demand, one of which is econometric and four of which are econometric-engineering end-use models. The models are from Ohio, Wisconsin, California, and New York. Five supply-demand and comprehensive libraries of models are also discussed, from Hawaii, Texas, Minnesota, New Mexico, and the New England Regional Commission. Sixty-eight models are briefly described as to purpose; energy system; application; status; validation; outputs by sector, energy type, economic and pysical units, geographic areas, and time frame; structure and modeling techniques; submodels; working assumptions; inputs; data sources; related models; costs; references; and contacts. The report includes a glossary of terms used in energy models and a brief discussion of other inventories of models of possible interest to readers of this report. The project was accomplished by telephone conversations, document reviews, correspondence, and visits to states by a team from Colorado School of Mines Research Institute and the faculty of Colorado School of Mines.

25593 **(PB—81-114225) Energy/economic model analysis. Volume 1: gas technology assessments using three energy supply/demand integrating models. Final report.** Cohen, S. (TRW, Inc., McLean, VA (USA). Energy Systems Planning Div.). Jun 1980. Contract GRI-5014-310-0201. 109p. NTIS, PC A06/MF A01.

The main outputs of the three models are forecasts of the energy (in Btu's) supplied or converted by various technologies and the prices associated with such supply or conversion. Forecasts are made at points in time during the period 1980-2025.

25594 **(PB—81-114233) Energy/economic model analysis. Volume 2: evaluation of energy supply/demand integrating models. Final report.** Cohen, S. (TRW, Inc., McLean, VA (USA). Energy Systems Planning Div.). Jun 1980. Contract GRI-5014-310-0201. 86p. NTIS, PC A05/MF A01.

The main objective of this evaluation is to give GRI and its advisors insight into how useful each model is in meeting the objectives of a particular GRI activity. A second major objective is to furnish insight on the similarities and differences of the numerical output associated with the RandD assessment project.

25595 (PB—81-114241) Energy/economic model analysis. Time-stepped energy system optimization model. Final report. Kydes, A.S.; Rabinowitz, J. (Brookhaven National Lab., Upton, NY (USA)). Jun 1980. Contract GRI-5014-310-0201. 137p. NTIS, PC A07/MF A01.

This report presents the energy results from the BNL/DJA energy-economy system as executed under GRI specifications. It is intended to serve as a complement to the DJA report on the macro-economic consequences of these specifications.

25596 (PB—81-114266) Energy/economic model analysis. Livermore energy policy model. Final report. Bell, R.B. (Lawrence Livermore National Lab., CA (USA)). Jun 1980. Contract GRI-5014-310-0201. 135p. NTIS, PC A07/MF A01.

This report describes the results of a study done by the Energy and Resources Planning Group of the Lawrence Livermore Laboratory (LLL) for the Gas Research Institute (GRI) using the LLL Economic Modeling System (EMS). The purpose of the study was to allow GRI to evaluate the appropriateness of their continued use of an energy model and, at the same time, for them to gain a better understanding of the consequences of current or proposed GRI supported research and development.

25597 (PB—81-114274) Energy/economic model analysis. Energy economic modeling system. Final report. Nesbitt, D.M.; Oman, D.B. (Decision Focus, Inc., Palo Alto, CA (USA)). Jun 1980. Contract GRI-5014-310-0201. 329p. NTIS, PC A15/MF A01.

The Decision Focus Incorporated (DFI) Energy-Economy Model used in this study is an integrating model designed in part to focus on two budget-related decisions. Specifically, the DFI model provides a robust but simple way of computing the benefits of successful RandD both in the aggregate and at the level of individual RandD projects.

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 25073, 25389, 25593, 25594, 25595, 25596, 25597, 25628, 25728, 25756, 25780, 25799, 25879, 26301, 26302

25598 (DOE/CE/04934—46) Financing of private small scale hydroelectric projects: a summary guide. (Franklin Pierce Law Center, Concord, NH (USA). Energy Law Inst.). May 1981. Contract AS02-78RA04934. 13p. NTIS, PC A02/MF A01. Order Number DE81023147.

Small-scale hydroelectric (SSH) projects are increasingly being supported financially by private developers. Increases in fossil fuel prices, difficulties in the siting of large power plants, streamlining of the federal licensing process, changes in the marketing of power, and the extension of tax credits-all contribute to expectations of profitability in SSH projects. This document provides an overview of private financing for SSH projects.

25599 (DOE/EIA—0149-80) 1980 EIA Publications Directory: a user's guide. (Department of Energy, Washington, DC (USA). Energy Information Administration). Jun 1981. 198p. NTIS, PC A09/MF A01. Order Number DE81026046.

This directory of Energy Information Administration publications, a product of the National Energy Information System published by the Office of Energy Information Services, exists as a service to the users of those publications. Each year, the agency produces about 200 reports totaling about 500,000 copies. The broad scope of EIA's data collection and analysis activities is well illustrated by a quick look through the pages that follow. Varying in frequency from weeklies to annuals and one-time special reports, EIA's family of publications provides historical information on all conventional fuels and the major emerging energy sources. The agency's analysts produce special reports on energy/economic issues, as well as forecasts of the energy future. Data collection programs under development also result in published reports, and EIA produces several reference guides and indexes. This volume, related to 1980 publications, contains abstracts, subject index, report number index, title index, publications availability information, and directions on how to order EIA publications. (LCL)

25600 (ORAU/IEA—81-5(M)) Energy and value. Roberts, P.C. (Oak Ridge Associated Universities, Inc., TN (USA)). Jun 1981. Contract AC05-76OR00033. 76p. NTIS, PC A05/MF A01. Order Number DE81023768.

Energy theories of value are reviewed and a new variant introduced, based on the empirical relationship between price per unit mass and energy requirement per unit mass for a wide range of commodities. It is shown that the demand pattern of households in the United Kingdom and the United States for energy (direct and embodied in goods) would tend to produce a declining ratio of energy to gross domestic product (GDP). However, the tendency of goods with low energy intensity to be associated with low-productivity gains introduces a counteracting effect, and energy/GDP ratios are fairly stable over time. The study of UK and US demand patterns is expanded to cover five additional developed countries, and their similarity is demonstrated once the effect of fuel price and time period of adjustment are taken into account. Finally, the simple relationship connecting energy intensity, fuel price, and time constant of adjustment is used to forecast (retrospectively) the energy use per dollar of GDP in each of the seven countries for the year 1976.

25601 (PB—81-113391) The economic and environmental structure of Alabama's coastal region, part II. Environmental structure. Nelson, R.G.; Hardy, W.E. Jr; Flynn, J.B. (Mississippi-Alabama Sea Grant Consortium, Ocean Springs, MS (USA)). Apr 1980. 55p. NTIS, PC A04/MF A01.

The information presented is an extension of an input-output model describing the economic structure of the two coastal counties in Alabama. This extension comprises a description of environmental considerations in the production of goods and services, and includes 34 water quality factors, 6 air quality factors, 11 solid waste factors, 3 water use factors, 10 fuel use factors, 4 land use factors, and 8 occupation factors. A detailed explanation of methodology is given, as well as an accounting of the amount of pollution produced or resource consumed by each of the 31 producing sectors used to characterize the coastal economy. The direct and indirect effects of these environmental factors are quantified in this model. An example of the use of economic-environmental input-output analysis in evaluating alternative regional investment strategies is given.

25602 (PB—81-114852) Energy choices in a democratic society. Supporting paper 7. Nader, L. (National Research Council, Washington, DC (USA). Committee on Nuclear and Alternative Energy Systems). Apr 1980. 156p. NTIS PC MF A01.

In a provacative discussion of energy policy and its relationship to social issues, Energy Choices in a Democratic Society presents four views of the future involving widely varying levels of energy consumption and life-styles. The futurists' intriguing descriptions of life in the imagined societies, loosely termed superindustrial, plentitude, small is beautiful, and minimum feasible are explored according to predictions about twelve cultural dimensions, including natural environment, settlement patterns, occupations, leisure, dispersion of decision-making power, and pluralism vs. homogeneity. These descriptions demonstrate some possible results of alternatives to be considered by scientists, policymakers, and citizens concerned about the direction of our energy policy.

25603 (PB—81-114894) Sociopolitical effects of energy use and policy. Supporting paper 5. Unseld, C.T.; Morrison, D.E.; Sills, D.L.; Wolf, C.P. (National Research Council, Washington, DC (USA). Committee on Nuclear and Alternative Energy Systems). Jan 1980. 511p. NTIS PC MF A01.

The report brings together, in one piece, the best available information on the social implications of a broad range of energy alternatives. Throughout more than 500 pages of text, contributed and commissioned papers explore the social and political themes of the national energy debate. It is the latest in a series of reports on the nation's prospective energy economy in the period 1985-2010.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 26063, 26107, 26114, 26147, 26171, 26196, 26297, 26298, 26303, 26403

25604 (CONF-801210—25) Impact of New Source Performance Standards on advanced industrial energy technology. Streets, D.G.; Grogan, P.J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 23p. NTIS, PC A02/MF A01. Order Number DE81023822.

From 3. Miami international conference on alternative energy sources; Miami Beach, FL, USA (15 Dec 1980).

When Congress revised the requirements for New Source Performance Standards (NSPS) under the Clean Air Act Amendments of 1977, it defined a technological system of continuous emission reduction to include not only postcombustion cleanup processes and pretreatment of fuels, but also new energy technologies that are inherently nonpolluting. The possibility of waivers for certain innovative technologies was also included. When EPA promulgated NSPS for utility boilers the concept of commercial demonstration permits was introduced, as a result of which certain innovative technologies were exempted from meeting the full standard for the first several thousand MW of capacity. This paper addresses whether certain advanced energy technologies could meet the kinds of NSPS currently being discussed for conventional steam generators in industry or what alternative approaches are preferable. Of particular interest to this work is cogeneration, because of its energy conservation potential, and fluidized-bed combustion, because of its favorable emissions characteristics. This work summarizes relevant market analysis for these technologies and estimates the effect of various regulatory options on market penetration. These regulatory options include the possibility of temporary waivers or exemptions, relaxed standards, and full standards.

25605 (PB—81-114605) An evaluation of air pollution abatement relaxation strategies for Tennessee during periods of pending or actual energy emergencies. (Tennessee State science, engineering, and technology project). Final report. Clinard, L.; Backhus, D.; Koehler, W. (Tennessee State Planning Office, Nashville (USA)). 1980. 185p. NTIS, PC A09/MF A01.

This report addresses problems associated with the relaxation of air pollution abatement strategies, during periods of pending or actual energy emergencies, for coal-fired plants in Tennessee. Several general and specific constraints which policymakers face in implementing the relaxation of air pollution standards are reviewed: the emission standards required for compliance with the Tennessee State Implementation Plan; a pending consent decree, issued by a Federal district court, relative to pollution abatement equipment required for compliance at several Tennessee Valley Authority steam plants; the regional character of the Tennessee Valley Authority coupled with the fact that it is a Federal agency; and the need for legal consistency with existing Tennessee and Federal statutes and for considerations of courtesy for overlapping state agencies. Specific stategies and procedures are offered for securing variances form the abatement requirements of the Clean Air Act legislation and the Tennessee State Implementation Plan. Recommendations of the study include the establishment of an Advisory Group, administered by the Tennessee Energy Authority as the lead state agency. Appropriate actions to be taken by the Advisory Group are to be based on average days of recoverable coal supply at plants affected during such energy emergencies.

25606 (PB—81-118721) Community environmental education: three models of organization for PSD Set II. Final report. Burke, P. (Appalachian State Univ., Boone, NC (USA)). Jun 1980. 57p. NTIS, PC A04/MF A01.

The study undertakes an examination of models of community environmental education relevant for PSD Set II. Issues of sufficient technical information, aspects of citizen participation, organizational theory, and politics are examined. Community environmental education is deemed to be feasible here, and three potential organizational models are presented: one focuses on the Cooperative Extension Service, one on regional planning bodies, and one on the community school network.

25607 (SAND—81-1359C) Program standard for assuring that today's management obligations in environmental, safety, and health areas are met. Trauth, C.A. Jr.; Ellingson, A.C.; Hollister, H.; Jercinovic, L.M. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 83p. (CONF-810823—1). NTIS, PC A05/MF A01. Order Number DE81024069.

From NSC industrial conference; Moline, IL, USA (13 Aug 1981).

This paper seeks to develop a management system that reflects the changing nature of hazards and society's concern about them without adding undue regulatory requirements.

25608 Risks and consequences in energy production. Inhaber, H. (Oak Ridge National Lab., TN (USA)). *Interdisciplinary Science Reviews ;* **5**: No. 4, 304-311(Dec 1980).

The word risk is often used in association with energy production and in some cases it is equated with consequences. The distinction is important and has implications for the study of energy systems. Failure in a given energy system, such as nuclear power or hydroelectric dams, can give rise to human consequences, such as deaths, injuries or disease. The extent of these consequences varies from one system to another. Furthermore, the probability of such failures is a characteristic of the given system. For example, a nuclear reactor or hydroelectric dam may have a probability of one catastrophic failure in x years of operation, where x is a large number. The probability multiplied by the number of deaths, injuries and illnesses caused by the failures - the consequences - can be taken as a measure of the risk, or risk index.

2904 Natural Resources

REFER ALSO TO CITATION(S) 25207, 25208, 25839, 26299

25609 Bureau of Economic Geology 1980 annual report. Austin, TX; Bureau of Economic Geology (1980). 47p. (NP—1903450).

The University of Texas Bureau of Geology reports on the scope and status of current research programs, publications, special services, and personnel activities for 1980. Major research topics include investigations of energy resources, land resources, and mineral resources; basin and coastal studies; geologic mapping; and sources of grant and contract support. The publications cover investigation reports, an environmental geologic atlas of the Brownsville-Harlingen coastal zone, and various guidebooks and circulars. Among its services, the Bureau provides computer services, public information services, mineral studies, and a well sample and core library. The personnel roster, divided into research and support staff, lists professional standings and publications. (DCK)

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 25616, 25636, 25663

25610 Ionizing radiation levels in energy conserving structures. May, H. (Argonne National Lab., IL). W-31-104-ENG-38. *Underground Space ;* **5**: No. 6, 384-391(May 1981).

The growth in the underground and earth-sheltered construction industry has been accompanied by increasing concern about the possibility of high radioactivity levels in below-grade structures, particularly those with low air-exchange rates. One air pollutant associated with high levels of radioactivity is the naturally-occurring radioactive gas radon. The author summarizes the physical principles governing release of radon to the atmosphere; discusses the factors that contribute to radon buildup and concentration in buildings; and examines data on health effects of long-term exposure to low levels of radon. The limited data on earth-sheltered structures suggests that radon levels in well constructed earth-shielded homes are not significantly higher than those reported for conventionally constructed (i.e., aboveground) houses. However, architects and engineers involved in design and construction of earth-sheltered structures - as well as other energy conserving buildings with relatively low air exchange rates - must design these

structures so as to minimize the exposure of their occupants to possible sources of harmful radiation effects. 15 references, 4 figures, 3 tables.

25611 **Multimarket, multitechnology, multiattribute technological forecasting.** Silverman, B.G. (George Washington Univ., Washington, DC). Contract AC-03-03-77ET-15078. *Energy Journal ;* **2**: No. 2, 119-122(Apr 1981).

This model was developed to provide a simplified yet systematic approach to the estimation of complex market penetration problems. The model permits the decision maker to determine simultaneously the market penetration of several technological innovations, under conditions consisting of (1) multiple market applications for each technological innovation, and (2) numerous competing technologies in each market application. Availability of this type of model is critical in a field such as energy, where an explosion of technological ideas into the marketplace appears to be imminent. The model described in this note, despite its elegance, is unique in the market penetration literature: a multiple competing-technologies market-penetration model that incorporates multiple attributes rather than strictly price into the (static) market share allocation function. The first-generation (deterministic and linear) version is complete; its structure, an application within DOE, and a summary of sensitivity analysis results are highlighted. 9 references.

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 25088, 25103, 25131, 25169, 25482, 25505, 25506, 25539, 25540, 25541, 25542, 25543, 25544, 25545, 25546, 25547, 25548, 25549, 25550, 25551, 25552, 25553, 25554, 25555, 25556, 25557, 25558, 25559, 25560, 25561, 25562, 25563, 25564, 25565, 25566, 26196

25612 **Forecasts of nuclear power and nuclear fuel requirements.** Glassey, C.R.; Clark, R.G. (DOE, Washington, DC). pp vp of Atomic Industrial Forum, Inc. fuel cycle conference, 1979. Bethesda, MD; At Ind Forum, Inc (1979).

From Atomic Industrial Forum fuel cycle conference; Atlanta, GA, USA (11 Mar 1979).

Different phases of nuclear forecasting are traced, from conservative uncertainty in 1960's through heightened optimism in early 1970's to downtrend in mid-1970's caused by increasingly stringent environmental and regulatory constraints on the growth of nuclear capacity and the severe perturbation in the pattern of electricity demand growth. After DOE was organized the data and analytical aspects of forecasting were separated from the policy aspects and became the responsibility of the Energy Information Administration (EIA). Discussed are the EIA forecasting methodology, domestic energy forecast results. EIA foreign nuclear power forecasts, "reference" nuclear fuel requirements, and uncertainties and sensitivities of nuclear fuel requirements forecast.

25613 **DOE's enrichment services--a long range policy.** Weiss, S.I. (DOE, USA). pp vp of Atomic Industrial Forum, Inc. fuel cycle conference, 1979. Bethesda, MD; At Ind Forum, Inc (1979).

From Atomic Industrial Forum fuel cycle conference; Atlanta, GA, USA (11 Mar 1979).

Outlined are some key initiatives supported by DOE in order to promote availability of nuclear power. One of them is introducing legislation in the Congress to reduce the lead time of nuclear plants from present 12-14 years to 6 or 7 years. A second area of concern is safety and effectiveness of nuclear waste disposal. Also mentioned are DOE's uranium enrichment program, inventory policy, etc.

25614 **DOE nuclear program--promise and perspective.** Brewer, S.T. (US DOE). pp vp of Atomic Industrial Forum, Inc. fuel cycle conference, 1979. Bethesda, MD; At Ind Forum, Inc (1979).

From Atomic Industrial Forum fuel cycle conference; Atlanta, GA, USA (11 Mar 1979).

The evolution of fission development policy in the U.S. over the past several decades is briefly reviewed. The current promise and perspective of advanced fission development in DOE is summarized in three major statements: 1) Emphasis on the maturity, continued deployment, and improvement of the LWR and its supporting fuel cycle; 2) Deferral of a national commitment to the breeder and other advanced technologies requiring reprocessing--while a broad array of options are examined in terms of resource utilization, economics, practicality and relative nonproliferation strategic value; and 3) Retention of a breeder option.

25615 **INFCE past midcourse.** Beckjord, E.S. (DOE, USA). pp vp of Atomic Industrial Forum, Inc. fuel cycle conference, 1979. Bethesda, MD; At Ind Forum, Inc (1979).

From Atomic Industrial Forum fuel cycle conference; Atlanta, GA, USA (11 Mar 1979).

Several fuel cycles are considered and the questions are identified which arise in applying the asssessment factors to each of the fuel cycles. A resolution of the energy availability/proliferation risk dilemma in INFCE is anticipated based upon: (1) for the near term, expanded use of the LWR once-through fuel cycle, and desirability of once-through fuel utilization improvements; and (2) a combination of technical and institutional developments over the next 20-25 years for advanced and fast breeder fuel cycles which maintain overall risk no greater than the risk of the LWR once-through fuel cycle.

2907 Transport And Storage

REFER ALSO TO CITATION(S) 24945, 25765, 25766

25616 **(DOE/ET/26704—7) Program evaluation and review system for the Division of Energy Storage Systems. Final report, July 1, 1977-May 31, 1981.** Wechsler, B.L. (Lehigh Univ., Bethlehem, PA (USA)). Jun 1981. Contract AS02-77ET26704. 22p. NTIS, PC A02/MF A01. Order Number DE81025629.

The Division of Advanced Conservation Technology of DOE (ACT) is responsible for that portion of the DOE program dealing with research and development in support of the transportation, electric power generation, residential, commercial, and industrial sectors, as well as in support of developments to increase solar energy use. Its primary efforts in this direction were encompassed in The Advanced Conservation Technology Program which embraces the following subprograms: batteries; electrochemical; thermal; chemical; advanced physical methods; applications analysis; and utility applications. ACT had the major problems of inconsistent proposal evaluation and difficulty in the administration of contracts due to lack of standard procedures for accepting, filing, and retrieval of information concerning Storage Division projects and proposals. ACT was given an operational evaluation and control system (SPERS) so that the decisions mentioned above could be dealt with on an inter- and intra- branch level. SPERS was developed as a computer-based information system for the purpose of aiding in the evaluation of ACT research proposals and reviewing and controlling ongoing funded projects. SPERS development included the creation of required software, system and program documentation, and definitions of standardized forms and procedures for the system. Each of these aspects of SPERS development and its use are discussed. (LCL)

2908 Waste Heat Utilization

REFER ALSO TO CITATION(S) 25438, 25768, 25769, 25803, 25834, 25835, 25839

25617 **Utilization of reject heat.** Olszewski, M. (ed.). New York, NY; Marcel Dekker, Inc. (1980). 203p.

Energy Power and Environment/9.

Two major productive energy-conservation options are addressed in this text. The first is the utilization of reject heat, and the second is the use of dual-purpose power generation systems to minimize the quantity of reject heat produced. As used throughout this text, the term reject or waste heat refers to energy that is rejected from a process after it is no longer of economic value to that process. The term dual-purpose power production indicates applications where energy that does have economic value in the power cycle is used for other, more valuable processes. Since dual-purpose applications reduce the total amount of energy wasted, they are frequently referred to as reject-heat-utilization systems and have,

therefore, been included in this text. A separate abstract was prepared for each of the six chapters.

25618 Use of low-grade reject heat. Olszewski, M. (Oak Ridge National Lab., TN). pp 3-54 of Utilization of reject heat. Olszewski, M. (ed.). New York, NY; Marcel Dekker, Inc. (1980).

Environmental regulations now make it costly for US industrial plants to reject low-grade (65.5°C or lower) heat streams into the atmosphere or water. Plants can use this heat in various economical ways, including as a saleable by-product in the case of power plants. The resource potential of reject heat amounts to 22% of total US energy consumption, although its nature varies with plant design and site-weather characteristics. The low temperatures make low-grade reject heat ideal for a number of biological applications, such as aquaculture, temperature control of greenhouses and animal enclosures, undersoil heating, wastewater treatment, and spray irrigation. Engineering aspects of these uses are described. Other possible uses include power production and process heating. Potential users need to ensure that these applications do not interfere with normal plant operations, that availability is reliable, and that the existing cooling system permits convenient use of the heat. The heat source generally needs to be within one mile of the user to be economical. 45 references, 14 figures, 2 tables. (DCK)

25619 Recovery of industrial waste heat. Gunn, M.E. Jr. (Dept. of Energy, Washington, DC). pp 55-95 of Utilization of reject heat. Olszewski, M. (ed.). New York, NY; Marcel Dekker, Inc. (1980).

The industrial sector's high energy demand and the economic impact of high energy costs are encouraging more industries to look to waste-heat recovery and use as an energy source. Large capital investments have made the practice unattractive to most indutries in the past. Waste heat varies in quality and application at each plant, making it essential for potential users to be well grounded in recovery techniques. This chapter provides background information in the energy requirements of industry; the characteristics of waste heat energy sources from condenser cooling water, contaminated process water, condensate, boiler and furnace exhaust, and product/process losses; and reviews existing technologies and devices. Several major recovery techniques, including heat-recovery devices and their applications, are described. 16 references, 13 figures, 7 tables. (DCK)

25620 Coupling technology for dual-purpose central station power plants. Reed, S.A. (Oak Ridge National Lab., TN). pp 99-109 of Utilization of reject heat. Olszewski, M. (ed.). New York, NY; Marcel Dekker, Inc. (1980).

Fuel cost and availability problems for large central-power stations with 30 to 40% efficiencies increase motivation to use their reject heat. Dual-purpose plants can reduce the amount of low-grade heat rejected by modifying the fuel cycle to produce both electricity and steam. Economics must determine whether the electrical output can be reduced to produce steam and whether the steam can be priced to make up for the lost revenue from power sales and the costs of piping and metering the steam. Most utility applications have produced potable water from seawater or steam or district heating. Diagrams illustrate four options for steam extraction points, which are a major engineering consideration. District-heating schemes are most economical if they are incorporated in the original plant and area development plans. 2 references, 4 figures. (DCK)

25621 Use of heat from dual-purpose power stations for district heating. Karkheck, J.P.; Powell, J.R. (Brookhaven National Lab., Upton, NY). pp 111-146 of Utilization of reject heat. Olszewski, M. (ed.). New York, NY; Marcel Dekker, Inc. (1980).

Energy-cascading schemes, such as district heating, become competitive as primary energy sources become scarce and more expensive. The best scheme for district heating is to distridistribute 100°C water heated in conjunction with power generation to nearby residential and commercial customers. One method for designing such systems and estimating costs develops a profile of the area's space and water heating demands to determine feasibility and provide regional data for engineering design work and system planning. Examples and case histories describe the planning considerations for the three distinct subsystems: the piping network, the building retrofits, and the heat sources. Countries that adopt policies encouraging energy-efficient technologies show the greatest expansion of hot-water district heating. 8 references, 9 figures, 3 tables. (DCK)

25622 Use of heat from dual-purpose central station for desalting applications. Reed, S.A. (Oak Ridge National Lab., TN). pp 147-165 of Utilization of reject heat. Olszewski, M. (ed.). New York, NY; Marcel Dekker, Inc. (1980).

Dual-purpose plants that produce electric power and potable water from saline water can sometimes be more economical than separate facilities if a seacoast site allows convenient feedwater and cooling water. A description of desalting principles and techniques covers multistage flash evaporation, vertical-tube evaporation, and the multi-effect multistage (MEMS) flash process. Dual-purpose desalting/power-generation plants use fuel more efficiently and lower the unit cost of steam. Saudi Arabia is one of several locations where high demand for both water and power favor this type of installation. The engineering considerations of coupling the two processes must take into account that while water can be stored, electricity must be consumed as it is produced. Another complication is finding an agreeable cost allocation and savings credit accounting system. 4 references, 7 figures. (DCK)

25623 Industrial cogeneration. Barnes, R.W. (Oak Ridge National Lab., TN). pp 167-188 of Utilization of reject heat. Olszewski, M. (ed.). New York, NY; Marcel Dekker, Inc. (1980).

The economics of large-scale power generation led to a 50-year decline in industrial cogeneration, although it now accounts for 5% or more of the total power used in four major industries. A review of industrial cogeneration technology describes steam-turbine systems, combustion-turbine systems, and diesel-engine systems. Fuel-conservation and economic analyses consider the thermodynamics of energy cascades in comparison with single-purpose systems. A number of incremental costs, load levels, and economic factors enter into the equations as well as institutional considerations. 19 references, 3 figures, 3 tables. (DCK)

25624 Indirect benefits of cogeneration district heating. Santini, D.J.; Levine, E.P. New York, NY; American Society of Civil Engineers (1980). 18p. $2.00.

The use of 93°C water, cogenerated at an electric power plant, for district heating is discussed. The economic feasibility and environmental effects are treated in detail, including construction labor and air quality studies. Economic attributes of geographic placement are treated and compared to grevious studies and other alternatives. Specifically, construction labor effects of district heating are compared to imported oil and three other coal-based supply operations. The same people (minorities) who would benefit from construction jobs on a district heating project will also be likely to benefit (after its completion) through improved air quality. 22 references. (MJJ)

2910 Conservation

REFER ALSO TO CITATION(S) 25038, 25198, 25362, 25365, 25366, 25617, 25673, 25674, 25675, 25676, 25691, 25710, 25711, 25719, 25720, 25726, 25727, 25730, 25731, 25732, 25734, 25735, 25736, 25737, 25738, 25739, 25740, 25741, 25742, 25743, 25744, 25745, 25746, 25748, 25754, 25756, 25763, 25764, 25780, 25781, 25782, 25787, 25788, 25789, 25790, 25791, 25792, 25793, 25794, 25797, 25799, 25807, 25839, 25847, 25848, 25849

25625 (CONF-7910214—, pp vp, 6p) **Future of energy managers groups.** Henshaw, T. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

The objectives of the Energy Managers Groups, formed to provide a regular opportunity for industry and commerce to exchange views and experiences on energy conservation matters are discussed. Group procedure, liaison and cooperation, government support, and options for the future are discussed. (MCW)

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 25599, 25633

25626 (BNL—51359) Long-range oil and gas supply methodology: proposed reformulation. Cherniavsky, E.A. (Brookhaven National Lab., Upton, NY (USA)). Feb 1981. Contract AC02-76CH00016. 30p. NTIS, PC A03/MF A01. Order Number DE81023858.

This report discusses problems in the current formulation of the Mid-term Oil and Gas Supply Modeling system, which is used by the Energy Information Administration of the Department of Energy. Modifications and enhancements to this modeling system are proposed, and data sources supporting the suggested changes are specified.

25627 Energy to the year 2000: a comparison of energy strategies. Linden, A. *Energy Management (Cleveland, Ohio)* ; **6**: No. 5, 26-28, 30(Oct 1980).

Mr. Linden explains the Energy Information Administration (EIA) forecasts, assumptions, and long-term projections. An effective synthetic fuels program seems important to goals of energy self-sufficiency. Demand in the residential, commercial, and transportation sectors will stay relatively constant, but demand in the industrial sector will exceed savings in efficiency improvement. Supply forecasts for 2000 show shifts to coal and nuclear power. Sensitivity analyses were made for these projections. EIA forecasts are compared with the results of studies by Resources for the Future and the Harvard Energy Project. (DCK)

25628 Aggregate elasticity of energy demand. *Energy Journal* ; **2**: No. 2, 37-75(Apr 1981).

Sixteen energy-sector models were used to derive a detailed analysis and summary of the aggregate elasticiy of demand and to suggest some limits to the application of aggregate elasticity in energy policy and planning. The three types of models used for the study were energy-economy models, energy system models, and sectoral models. An overview of the models describes how they estimate aggregate elasticity and notes several issues which were addressed during the computation. The study concludes that even if the point of measurement, method of aggregation, price change computation, time frame, taxes, and regulations are standardized factors, differences will emerge which produce a range of estimates. The group recommends that modelers develop consistent accounting methods and standardize their data presentations. 17 references, 8 figures, 9 tables. (DCK)

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 24968, 25041, 25213, 25231, 25607, 25634, 25726, 25727, 25781, 25790, 26172, 26403

25629 (ANL/CNSV-TM—60, pp 435-442) **Policy overview of the issues of waste flow control.** Brenneman, R.L. (Murtha, Cullina, Richter and Pinney, Hartford, CT). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Waste control policy issues involve answering a number of questions, some of which are: (a) whether public regulatory control of the waste stream is needed, (b) what constitutes the controlled waste (and how that determination is made), (c) why controls should be instituted in support of resource recovery (public health, materials recovery, energy production, economic development, protection of public investment), (d) who should have control of the waste stream (generator, collector, local public health jurisdiction, state, federal), and (e) how the waste stream is to be controlled (contract, regulations, financial incentives/disincentives). When developing a resource recovery system, these questions come up when dealing with real or apparent conflicts between various goals, i.e., when assuring an adequate supply of processable raw material (waste) versus reduction of overall volume of waste, maximizing the value recoverable from the waste processing facility versus source separation, deriving the greatest achievable energy outputs from the processing facility versus front-end or source-separation recovery of combustibles for recycling as materials, put-or-pay guarantees of the quantity and quality of waste versus promoting a flexible system that accepts changes in quantity and quality over time, deriving economies of scale from large system versus achieving the flexibility and redundancy available in multiple smaller units, maximizing volume of input by enlarging wasteshed versus minimizing the cost of transportation. Waste stream control policies should be the product of a sophisticated analysis whose results are influenced strongly by existing or anticipated legal/institutional arrangements; public and private financial considerations relative to the resource recovery sytem; pre-existing control systems, or the absence of them; and the public perception of the advantage of one type of control system or disposal option over another.

25630 (ANL/CNSV-TM—60, pp 443-453) **Legal and practical aspects of controlling the waste flow: a case study from Delaware County, Pennsylvania.** Aman, G.M. III (Morgan, Lewis and Bockius, Philadelphia, PA); Schaeffer, J.E. Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The legal aspects of controlling waste flow are numerous and complex. They can best be understood in reference to a specific project. This project, which is still in the planning stage, involves an energy recovery plant for the County of Delaware, which adjoins Philadelphia, and has a population of approximately 600,000. The development of the project, the control problem, and the proposed control framework are described. In connection with these, legal aspects, constitutional aspects and federal antitrust questions are addressed. (DMC)

25631 (PB—81-800112) Energy policy and research planning. October, 1977-September, 1980 (Citations from the NTIS Data Base). Report for Oct 77-Sep 80. Hundemann, A.S. (National Technical Information Service, Springfield, VA (USA)). Sep 1980. 260p. NTIS PC N01/MF N01.

Citations relative to planning for future U.S. energy needs on both national and state government levels are presented. The history and development of national and state legislation and regulations, Project Independence studies, and assessment of the effects of deregulation are included. Technical, economic, and environmental considerations in energy planning are also covered. (This updated bibliography contains 254 citations, 77 of which are new entries to the previous edition.)

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 24857, 24945, 24968, 24969, 24969, 24971, 25038, 25041, 25067, 25068, 25073, 25084, 25626, 25626, 25638, 26172, 26297

25632 (DOE/EIA—0191(80)) Cost and quality of fuels for electric utility plants: Energy data report. 1980 annual. (Department of Energy, Washington, DC (USA). Energy Information Administration). 25 Jun 1981. 211p. NTIS, PC A10/MF A01. Order Number DE81025524.

In 1980 US electric utilities reported purchasng 594 million tons of coal, 408.5 million barrels of oil and 3568.7 billion ft^3 of gas. As compared with 1979 purchases, coal rose 6.7%, oil decreased 20.9%, and gas increased for the fourth year in a row. This volume presents tabulated and graphic data on the cost and quality of fossil fuel receipts to US electric utilities plants with a combined capacity of 25 MW or greater. Information is included on fuel origin and destination, fuel types, and sulfur content, plant types, capacity, and flue gas desulfurization method used, and fuel costs. (LCL)

25633 (EMD—81-57) Department of Energy's reorganization of Energy contingency planning holds promise - but questions remain. Staats, E.B. (General Accounting Office, Washington, DC (USA)). 4 Mar 1981. 13p. General Accounting Office, Washington, DC. Order Number DE81903695.

Contingency planning in the event of energy import disruption is the topic of this letter from the Comptroller General to Senators Edward Kennedy and Charles Percy. A description of an upcoming comprehensive report on this topic is presented. Specific problems with DOE's present contingency plan are detailed.

25634 Policy implications of energy vulnerability. Plummer, J.L. (Electric Power Research Inst., Palo Alto, CA). *Energy Journal ;* **2**: No. 2, 25-36(Apr 1981).

Mr. Plummer observes that the US needs to follow Europe's lead and focus on the oil problem, either increased production or more conservation, rather than simply freeing markets to reduce vulnerability to import disruptions. The premium on stockpiling oil as a way to reduce imports may be higher than anticipated, but the fill rate should still be increased to assure an optimum stockpile size of two billion barrels. The government can stimulate private-sector stockpiling by assuring firms that it will not confiscate working inventories during a disruption. This can be done through regulation, through a quasi-public corporation, or through federal subsidies. A comparison of stockpiling and disruption tariffs shows that stockpiling requires some sacrifice during normal times, while disruption taxes can cause destabilizing economic hardships and political reprisals during disruptions. Policies for coping with disruptions are rated, the first-best instrument imposing an oil import tariff, followed by use taxes and subsidies. Other policy options include research and demonstration programs, substituting natural gas, joint actions with other oil-importing countries, financing oil projects in developing countries, and military investments in the Persian Gulf. 7 references. (DCK)

25635 Sources of deep-coal-mine productivity change, 1962 to 1975. Baker, J.G. (Oak Ridge Associated Universities, TN). *Energy Journal ;* **2**: No. 2, 95-106(Apr 1981).

Labor productivity in bituminous deep mines grew to a peak of 15.6 tons per miner per shift in 1969, when it began a decline that fell to 8.7 tons per miner per shift by 1977. This productivity decline increases the labor-related constraints on coal-industry growth, causes coal prices to rise in relation to supply, and increases the injury and death risks by prolonging exposure. A two-step productivity function first analyzes geological, technological, economic, and institutional factors and examines how these characteristics have changed over time. The results show the Coal Mine Health and Safety Act of 1969 accounts for most of the productivity loss until 1973, when strikes and economic conditions took precedence. The rapid change between the 1960s and 1970s also reflects the internalization of health and safety costs within the industry. 11 references, 3 tables. (DCK)

2950 Hydrogen And Synthetic Fuels

REFER ALSO TO CITATION(S) 24970, 25638, 25758, 25892

25636 (EMD—81-36) Special care needed in selecting projects for the Alternative Fuels Program. Staats, E.B. (General Accounting Office, Washington, DC (USA)). 8 Dec 1980. 22p. General Accounting Office, Gaithersburg, MD. Order Number DE81903693.

Report to the Chairman, Subcommittee on Energy and Power, Committee on Interstate and Foreign Commerce, House of Representatives by the Comptroller General of the United States.

Under the Alternative Fuels Program, the Department of Energy is providing financial incentives to expedite the development of alternatives to imported oil. GAO reviewed the Department's procedures and criteria for soliciting, evaluating, and selecting the recipients of feasibility study and cooperative agreement grants. GAO believes that the technical evaluations of the proposals were reasonably comprehensive and thorough and that evaluation criteria were appropriate and consistently applied. However, the Department's frequent use of policy factors, such as geographic diversity, to alter technical rankings during the final selection of projects, heightens GAO's concerns regarding the integrity of the selection process. This is an area which will require close attention and one where the Department will have to exercise special care to avoid any inferences of impropriety in future project selections.

2960 Electric Power

REFER ALSO TO CITATION(S) 25214, 25435, 25438, 25598, 25632, 25666, 25822

25637 (BNL—51326) Socioeconomic impacts of time-of-day pricing by electric utilities: a case study of Philadelphia residential customers. Roberts, L.J. (Brookhaven National Lab., Upton, NY (USA)). Feb 1981. Contract AC02-76CH00016. 42p. NTIS, PC A03/MF A01.

The potential social and economic impacts of time-of-day pricing on residential electric utility customers in the Philadelphia area are analyzed. Since time-of-day rates have not yet been instituted in Philadelphia, the analysis centers on general information found in the literature on elasticity of demand for electricity as well as the relationships between energy use and family income. A specific example of possible differential impacts among various income classes after the adoption of time-of-day rates is also detailed. This information is drawn from a particular rate experiment conducted in the state of Wisconsin. The applicability of the results of this experiment to the Philadelphia area is discussed in detail. Finally, a survey of appliance ownership and housing stock characteristics for Philadelphia residential electric utility customers is reviewed and incorporated into a derived demand analysis for electricity consumption. Given the lack of specific rate impact information, which could be used to accurately predict the likely effect of time-of-day rates upon this class of customers, the final analysis is fairly qualitative. A series of important policy questions are thus outlined, based on the findings of the analysis.

25638 (CONF-800608—8) Economic and environmental tradeoffs in coal conversion. Livengood, C.D.; Huang, H.S.; Farber, P.S. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 20p. NTIS, PC A02/MF A01.

From Air Pollution Control Association annual meeting; Montreal, Canada (Jun 1980).

Unless significant cost breakthroughs can be achieved, we must conclude that SRC-I does not appear economically competitive for new, large power plants. However, the costs of environmental control systems and the difficulties of solid waste disposal could favor use of SRC-I in plants converting from oil. Finally, the recent increased interest in reducing emissions from existing coal-fired plants as a control measure for acid rain could open up a significant new market for highly processed coal such as SRC-I.

25639 (CONF-800804—41) Preliminary evaluation of automated ICES selection methodology, cost. Voelker, J.; Lee, C.; Price, W.; Rabl, V. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 18p. NTIS, PC A02/MF A01. Order Number DE81023121.

From ASME century 2 emerging technology conference; San Francisco, CA, USA (10 Aug 1980).

A computer program, COST (Cost Optimizing Selection Technique), for the selection of an Integrated Community Energy System (ICES) was tested to evaluate its overall performance. The testing procedure used data corresponding to a community for which an ICES application had previously been conceptually designed and evaluated by conventional manual means. COST was developed to select the optional ICES tailored to a specific community. This involves finding the best generic types and capacities of equipment that can minimize annual costs. For time intervals chosen to represent different seasons, weekdays/weekends, and different times of day, the program determines equipment operating levels and amounts of purchases and sales of appropriate energy forms. The optimization criterion accounts for capital expenditures, operating costs, and the purchase and sale of energy forms - all with the requirement that community energy requirements be satisfied. To accomplish this, mathematical programming (Benders' Partitioning Algorithm) is used. The results of preliminary testing indicate that the output of COST is internally consistent, intuitively plausible, and consistent with the benchmark manual analysis. COST is expected to facilitate the assessment of system alternatives under varying assumptions; for example, assumptions with respect to economic parameters, relationship with the grid, community energy demand, and candidate sets of equipment.

25640 **(DOE/RG/10367—T3) Quarterly project status report, April-June 1981.** (Systems and Applied Sciences Corp., Riverdale, MD (USA)). Jun 1981. Contract AC01-80RG10367. 19p. NTIS, PC A02/MF A01.

Progress is reported on Systems and Applied Sciences Corporation support to ERA to implement ERA's information data base. The purposes stated in PURPA are to promote conservation of energy supplied by utilities, efficiency in use of utilities, and equitable rates for utility consumers. ERA is required to assist state regulatory authorities and nonregulated utilities in carrying out their PURPA responsibilities by implementing information dissemination activities. A detailed description of performance, a description/schedule chart of performance, and a future work schedule are presented.

25641 **(PB—81-103392) Oil savings from greater intertie capacity between the Pacific Northwest and California. Report to the Secretary of Energy.** (General Accounting Office, Washington, DC (USA). Energy and Minerals Div.). 24 Sep 1980. 19p. NTIS, PC A02/MF A01.

As part of a continuing effort to assess the Federal power marketing agencies' operations and because the existing interties between the Pacific Northwest-Southwest cannot carry the potential for all power exchanges, the benefits from expanding the Pacific Northwest-Southwest electricity interconnections were studied.

25642 **(PB—81-110322) Comparative class rates of return in the electric utility industry: a comparative study of electric rates charged to small business consumers. Final report.** Wilson, J.W. (Wilson (J.W.) and Associates, Inc., Washington, DC (USA)). Mar 1980. Contract SBA-2646-OA-79. 74p. NTIS, PC A04/MF A01.

This report presents a survey of the comparative profit-ability of serving the commercial, residential and industrial classes of customers under traditional rate structures for major electric utility companies in the United States.

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 25193, 25199, 25217, 25218, 25219, 25220, 25221, 25222, 25223, 25229, 25230, 25231, 25231, 25256, 25275, 25289, 25290, 25297, 25322, 25327, 25328, 25342, 25344, 25392, 25393, 25396, 25429, 25431, 25432, 25636, 25812, 25812, 25849

25643 **(PB—81-109316) Survey of EPA facilities for solar thermal energy applications. Final report 1 Nov 77-30 Jun 78.** Nelson, E.V.; Overly, P.T.; Bell, D.M. (Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.). Oct 1980. Contract EPA-68-03-2567. 155p. NTIS, PC A08/MF A01.

A study was done to assess the feasibility of applying solar thermal energy systems to EPA facilities. A survey was conducted to determine those EPA facilities where solar energy could best be used. These systems were optimized for each specific application and the system/facility combinations were ranked on the basis of greatest cost effectiveness.

25644 **Industrial development of biomass energy sources.** Schaefer, G.P. (Booz-Allen and Hamilton, Inc., Bethesda, MD). *ACS (American Chemical Society) Symposium Series ;* No. 144, 3-17(1981). (CONF-790415—P8).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

A wide diversity of companies has entered into the development of biomass resources. The composition of these companies and their motivations are important to government policymakers and companies considering entry into the industry, for the motivations provide a framework with which to evaluate alternative options. It is important to know, for example, that the development of energy from biomass is of secondary importance to many companies when developing a new marketing plan or tax incentive program. An assessment was made of the nature of industrial activities in the utilization of biomass for energy. This assessment, performed in the summer and fall of 1979, focused upon identifying the structure of the industry, the types of companies active in the industry, what they are doing, and what the motivations are for these activities. The data collected indicate that private sector involvement in biomass energy development is extensive despite industry's perception that federally sponsored work has had little impact. Another key finding was that government regulatory policies generally had a greater effect upon industry than DOE and these policies often contradicted DOE's position.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

25645 **(ANL/MHD—80-19) MHD Heat and Seed Recovery Technology Project. Eleventh quarterly report, July-September 1980.** Petrick, M.; Johnson, T.R. (Argonne National Lab., IL (USA)). Mar 1981. Contract W-31-109-ENG-38. 76p. NTIS, PC A05/MF A01.

In the MHD Heat and Seed Recovery Technology Project at Argonne National Laboratory, information is obtained for the design and operation of the steam plant downstream of the MHD channel-diffuser, and for the seed regeneration process. The project goal is to supply the engineering data required in the design of components for prototype and demonstration MHD facilities. The primary effort of the HSR Technology Project at Argonne is directed toward experimental investigations of critical problem areas, such as: (1) corrosion and erosion of refractories and metal alloys; (2) NO/sub x/ behavior in the radiant boiler and secondary combustor; (3) radiant boiler design to meet the multiple requirements of steam generation, NO/sub x/ decomposition, and seed-slag separation; (4) effects of solid or liquid seed deposits on heat transfer and gas flow in the steam and air heaters; (5) formation, growth, and deposition of seed-slag particles; and (6) character of the combustion gas effluents. These investigations are performed primarily in a 2-MW test facility, the Argonne MHD Process Engineering Laboratory (AMPEL). Other project activities are related to studies of the thermochemistry of the seed-slag combustion gas system, and evaluation of seed regeneration processes. Progress is reported.

25646 **(CONF-800617—8) Liquid-metal MHD for solar and coal.** Pierson, E.S.; Cohen, D.; Grammel, S.J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 10p. NTIS, PC A02/MF A01. Order Number DE81023545.

From 7. international conference on MHD electrical power generation; Cambridge, MA, USA (16 Jun 1980).

The two-phase-generator, liquid-metal magnetohydrodynamic (LMMHD) energy conversion system has an inherently thermodynamic efficiency for the same heat source and sink temperatures and is better suited for cogeneration than other conversion systems. For solar applications, attractive efficiencies in comparison with alternative systems are calculated at ~ 580 K and ~ 1090 K, and cogeneration advantages are indicated. For coal applications, recent coal combustion gas-copper reaction results show that the copper can be used to control SO_2 emissions. The calculated cycle efficiencies are comparable to those for open-cycle plasma MHD at combustor temperatures of 2220 K or less.

25647 **(CONF-800631—10) Design and construction of a large superconducting MHD magnet for the Coal-Fired Flow Facility at the University of Tennessee Space Institute.** Wang, S.T.; Genens, L.; Gonczy, J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01. Order Number DE81023520.

From 8. international cryogenic engineering conference; Genoa, Italy (3 Jun 1980).

The Argonne National Laboratory has designed and is constructing a large superconducting MHD dipole magnet system for use in the Coal-Fired Flow Facility (CFFF) at the University of Tennessee Space Institute (UTSI). The complete system will be tested at Argonne and installed at the UTSI during the early part of 1981. The magnet system has a peak on-axis field of 6.0 T and a warm aperture of 80 cm at the MHD channel inlet, 100 cm diameter at the end of effective field and an effective field length of 3.0 m. The MHD warm bore and magnet cryostat are shown, and significant magnet parameters are given.

25648 **(CONF-800806—42) Liquid-metal MHD for solar and coal: system and component status.** Pierson, E.S.; Grammel, S.J.; Cohen, D.; Frisardi, T. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01. Order Number DE81023120.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

The motivations for using two-phase-generator liquid-metal MHD (LMMHD) energy-conversion systems with solar collectors and cyclone-type coal combustors are given. The solar LMMHD studies presented focus on two collector temperatures - ~ 590°K (600°F) with an LMMHD Rankine cycle, an attractive temperature for near-term use, and ~ 1090°K (1500°F) with an LMMHD Brayton cycle, typical of higher-performance long-range uses. The coal LMMHD studies emphasize the development of a new system model and its application to performance and optimization analysis, and reactions of liquid copper with coal combustion products (gas, slag) and the use of the copper to control environmental impacts. Cogeneration applications and retrofits of existing central-station electric plants are particularly-attractive options for LMMHD with both solar and coal. High-efficiency high-power-density, and high-temperature LMMHD generator data are summarized, because they indicate that large, high-efficiency generators can be built. The status of the two-phase mixer and separator is discussed.

25649 **(CONF-800806—43) US/USSR joint MHD generator testing at the U-25 MHD pilot plant.** Picologlou, B.F. (Argonne National Lab., IL (USA)). Aug 1980. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01. Order Number DE81023119.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

Joint generator tests performed recently at the U-25B MHD Facility are reviewed and their relevance to MHD generator testing is discussed. These tests employed Soviet channel No. 2 and the US superconducting magnet system. The MHD generator, achieving its design electrical power (1.2-1.4 MW), developed ~ 1.3 MW with potassium seeding and ~ 1.5 MW with cesium seeding. The generator operated stably at high power levels over a continuous period of 2.5 h under test conditions approaching those anticipated in commercial-size MHD plants with respect to a number of important parameters, e.g., Hall field, Hall parameter, current density, plasma conductivity, wall heat flux. The extensive data on the gasdynamical, electrical, and thermal characteristics of the generator gathered during these tests are used to validate and improve analytical methods of predicting MHD generator performance. Preliminary results of comparison of experiments with theory are presented.

25650 **(DOE/ET/10815—T4) Development and heat transfer analysis of direct coal-fired MHD combustors.** Roy, G.D.; Attig, R.C. (Tennessee Univ., Tullahoma (USA). Space Inst.). Jun 1981. Contract AC02-79ET10815. 71p. NTIS, PC A04/MF A01. Order Number DE81025200.

The development of MHD coal combustors at (UTSI) is based on experimental and analytical experience and knowledge gained over a period of ten years. In the earlier experiments, coal mixed with potassium salt (seed) was burned with pure oxygen. A diagnostic conductivity channel was used in the tests and the measured bulk conductivity was used as a criterion for combustor performance. Even though the bulk conductivity measurement is a good indication of the performance of the coal combustor for MHD generator application, this is not the most effective method. A better approach is to study the performance of the generator as a function of the combustor geometry and other factors (MHD combustor/generator interaction); knowledge of the heat flux distribution and the heat losses at various locations is necessary. The heat loss in the coal combustor increases the cost of electricity and should thus be kept at a minimum. For higher conductivities, the thermal energy of the coal should be released as completely as possible. So an efficient and stable coal combustor with a low surface-to-volume ratio is to be designed. The uncertainty in the particle size and mixing, the varying amount of slag coating and associated changes in geometry, and the difficulty in the precise control of coal flow rate require detailed experimental study to optimize coal combustion for MHD generators. Since the resulting performance of the generator is the best criterion of combustor selection, detailed combustor/generator interaction testing was undertaken. Heat transfer was used as one diagnostic tool among others. Details of this testing and data analysis are presented. (WHK)

25651 **(DOE/NASA/10769—14) MHD channel study for the ETF conceptual design.** Wang, S.Y.; Staiger, P.J.; Smith, J.M. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. Contract AI01-77ET10769. 13p. (NASA-TM—81764; CONF-810639—5). NTIS, PC A02/MF A01.

From 19. symposium on the engineering aspects of magnetohydrodynamics; Tullahoma, TN, USA (15 Jun 1981).

The procedures and computations used to identify an MHD chanel for a 540 mW/sub T/ ETF-scale plant are presented. Under the assumed constraints of maximum E/sub x/, E/sub y/, J/sub y/, and β, results show the best plant performance is obtained for active length, L ~ 12 M, whereas in the initial ETF studies, L ~ 16 M. As MHD channel length is reduced from 16 M, the channel enthalpy extraction falls off, slowly. This tends to reduce the MHD power output. But the shorter channels result in lower heat losses to the MHD channel cooling water which allows for the incorporation of more low pressure boiler feedwater heaters into the system and an increase in steam plant efficiency. In addition to the sensitivity of various channel parameters (B, K, L, Ma, and P/sub C/, the trade-offs between the level of oxygen enrichment and the electrical stress on the channel are also discussed.

25652 **(EPRI-AP—1864) Open-cycle MHD technology status and development perspective: operational analysis of open-cycle MHD.** Lippert, T.E. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research Labs.). May 1981. 57p. NTIS, PC A04/MF A01.

The overall technical and economic issues related to open cycle magnetohydrodynamic (OCMHD) development for an electric utility central power plant application are discussed. An engineering perspective is provided on the requirements and development needs of the MHD components and processes based on existing overall power plant system studies. For each key technology, a brief review and status are provided and the development path in the national program plan indicated.

25653 **Subsonic diffusers for MHD generators.** Brogan, T.R. (Meppsco, Inc., Boston, MA); Idzorek, J.J.; Swallom, D. pp 125-138 of Fluids engineering in advanced energy systems. Marston, C.H. New York, NY; American Society of Mechanical Engineers (1978).

From ASME meeting; San Francisco, CA, USA (10 Dec 1978).

The paper discusses the interaction between the diffuser and MHD channel performance and reviews the state of the art regarding short subsonic diffusers with high inlet blockage. It has been found that conventional short, straight-wall, three-dimensional nonseparating diffusers will display a recovery coefficient of 0.45 to 0.50 in the MHD environment. This performance leaves much to be desired. With high inlet blockage, the performance of a nonseparating diffuser is comparable to that of a configuration operating with incipient separation. The diffuser exit flow pattern may cause a strong recirculation pattern to develop in the stream generator. This factor should be taken into account in the design of the radiant boiler. Vortex generators, contouring, and gas injection are potential methods for improving MHD diffuser performance, but any design must offer the compatibility of the diffuser configuration with the high velocity slag and seed-laden gas.

25654 **Method of generating electricity using an endothermic coal gasifier and MHD generator.** Marchant, D.D.; Lytle, J.M. US Patent Application 177,327. 12 Aug 1980. 22p.

A system and method of generating electrical power is described wherein a mixture of carbonaceous material and water is heated to initiate and sustain the endothermic reaction of carbon and water thereby providing a gasified stream containing carbon monoxide, hydrogen and nitrogen and waste streams of hydrogen sulfide and ash. The gasified stream and an ionizing seed material and pressurized air from a preheater go to a burner for producing ionized combustion gases having a temperature of about 5000 to

about 6000°F which are accelerated to a velocity of about 1000 meters per second and passed through an MHD generator to generate DC power and thereafter through a diffuser to reduce the velocity. The gases from the diffuser go to an afterburner and from there in heat exchange relationship with the gasifier to provide heat to sustain the endothermic reaction of carbon and water and with the preheater to preheat the air prior to combustion with the gasified stream. Energy from the afterburner can also be used to energize other parts of the system.

25655 **Method for manufacturing magnetohydrodynamic electrodes.** Killpatrick, D.H.; Thresh, H.R. (to to Dept. of Energy). US Patent Application 162,543. 24 Jun 1980. 13p.

A method of manufacturing electrodes for use in a magnetohydrodynamic (MHD) generator is described comprising the steps of preparing a billet having a core of a first metal, a tubular sleeve of a second metal, and an outer sheath of an extrusile metal; evacuating the space between the parts of the assembled billet; extruding the billet; and removing the outer jacket. The extruded bar may be made into electrodes by cutting and bending to the shape required for an MHD channel frame. The method forms a bond between the first metal of the core and the second metal of the sleeve strong enough to withstand a hot and corrosive environment.

25656 **MHD/steam electrical power production-a status report.** Chapman, J.N.; Strom, S.S.; Wu, Y.C.L.; Dicks, J.B. Jr. (Univ. of Tennessee Space Inst., Tullahoma). pp 723-735 of Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal. Houston, TX; Coal Technology '80 Conference (1980).

From 3. international coal utilization exhibition and conference; Houston, TX, USA (18 Nov 1980).

The MHD/Steam Power Plant has promise to burn coal and produce electrical power more efficiently than conventional coal fired plants while producing less environmental intrusion. Problems have been encountered in developing a high temperature air heater (HTAH) using coal exhaust products. Early commercial plants have been proposed that use either a gasifier to produce clean fuel for a separately fired HTAH or use oxygen enrichment to avoid the need for an HTAH. Component development is progressing rapidly but test data are needed at intermediate sizes before a commercial plant can be designed with high confidence of success. Related commercial technology is being adapted for the steam bottoming plant.

3003 Thermoelectric Generators

25657 **(DOE/ET/33003—T2) Progress report No. 29 for a program of thermoelectric generator testing and RTG degradation mechanisms evaluation.** Stapfer, G.; Garvey, L. (Sandia Labs., Livermore, CA (USA)). Feb 1979. Contract AI03-76ET33003. 60p. NTIS, PC A04/MF A01.

Thermal conductivity measurements of the P-type and N-type selenide alloys after 17000 hours and 4100 hours, respectively, are in good agreement with the 3M Co data. Ingradient testing of N-legs after 6600 hours show comparable performance to the reported 3M data. Ingradient testing of P-legs at accelerated test conditions, have completed 3600 hours and performance shows reasonable correlation with accelerated temperature and current gradients. N-type samples from both the Thermal Conductivity Tests and Ingradient Performance Tests were removed from test for examination. All samples were found to be severely cracked upon removal from the test fixtures. Metallurgical and x-ray diffraction analysis showed (1) extensive cracking had occurred in the lower half (cold end) of the legs and (2) a crystallographic phase change occurred in the upper half (hot end) of the legs from monoclinic to orthorhombic. It is postulated that the phase change that occurs on heating aggravates the micro-cracks that exist in the as fabricated leg. An initial evaluation of the performance of the Voyager 1 and 2 RTG's after 12,000 hours of operation versus the DEGRA performance prediction code, shows excellent agreement. (WHK)

25658 **Thermoelectric energy converter for generation of electricity from low-grade heat.** Jayadev, T.S.; Benson, D.K. (to to Dept. of Energy). US Patent Application 153,241. 27 May 1980. 15p.

A thermoelectric energy conversion device which includes a plurality of thermoelectric elements is described. A hot liquid is supplied to one side of each element and a cold liquid is supplied to the other side of each element. The thermoelectric generator may be utilized to produce power from low-grade heat sources such as ocean thermal gradients, solar ponds, and low-grade geothermal resources. (WHK)

3004 Thermionic Converters

25659 **(DOE/ET/11292—T4) DOE/JPL Advanced Thermionic Technology Program. Progress report No. 44, July-August-September 1980.** (Thermo Electron Corp., Waltham, MA (USA)). 1980. Contract AC02-76ET11292. 81p. (COO—3056-59). NTIS, PC A05/MF A01.

The primary long-term goal of the DOE effort is to improve TEC performance to the level that thermionic topping of fossil fuel powerplants becomes technically possible and economically attractive. The focus of the JPL program is to develop thermionic conversion technology appropriate for nuclear electric propulsion (NEP) missions. DOE program accomplishments include: (1) continuing combustion life test of the one-inch diameter hemispherical silicon carbide diode (Converter No. 239) at an emitter temperature of 1730°K for a period of over 2200 hours; (2) thermal shock tests of a composite CVD hot shell-emitter structure by heating to 1875°K and quenching with water (10 times) and liquid nitrogen (10 times); (3) thermal cycle tests of a composite CVD hot shell-emitter structure with heating and cooling periods less than 30 seconds; and (4) successful pressure test of composite CVD hot shell-emitter structure to 500 psi for three hours. JPL program accomplishments include: (1) the average minimum barrier index of the last five research diodes built with sublimed molybdenum oxide collectors was 2.0 eV; and (2) the converters constructed with sublimed molybdenum oxide collectors have activated in a rapid and well defined manner and given favorable output characteristics which are reproducible after a change in operating point. (WHK)

25660 **(DOE/ET/11292—T5) DOE/JPL Advanced Thermionic Technology Program. Progress report No. 45, October-November-December 1980.** (Thermo Electron Corp., Waltham, MA (USA)). 1980. Contract AC02-76ET11292. 54p. (COO—3056-62). NTIS, PC A04/MF A01.

The primary long-term goal of the DOE effort is to improve TEC performance to the level that thermionic topping of fossil fuel powerplants becomes technically possible and economically attractive. An intermediate goal is to demonstrate an in-boiler thermionic module in the early 1980's. A short-term goal is the demonstration of the reliability of thermionic operation in a combustion environment. The focus of the JPL program is to develop thermionic conversion technology appropriate for nuclear electric propulsion (NEP) missions. Accomplishments in the DOE program include: (1) continuing stable output from the combustion life test of the one-inch diameter hemispherical silicon carbide diode (Converter No. 239) at an emitter temperature of 1730°K for a period of over 4200 hours; (2) construction of four diode module completed; (3) favorable results obtained from TAM combustor-gas turbine system analyses; and (4) obtained a FERP work function of 2.3 eV with the W(100)-O-Zr-C electrode. JPL program accomplishments include: the average minimum barrier index of the last six research diodes built with sublimed molybdenum oxide collectors was 2.0 eV. (WHK)

3005 Fuel Cells

REFER ALSO TO CITATION(S) 25881

25661 **(AD-A—089776) Definition of chemical and electrochemical properties of a fuel cell electrolyte. Final technical report 25 Mar 77-24 Jun 80.** Foley, R.T. (American Univ., Washington, DC). Jun 1980. Contract DAAK70-77-C-0080. 72p. NTIS, PC A04/MF A01.

The research was oriented toward the task of developing an improved electrolyte for the hydrocarbon-air fuel cell. A literature study of the properties of organic acids indicated that the following types of compounds warranted investigation: armoatic polycarboxylic acids, perfluoroaliphatic carboxylic acids, mono, di and poly sulfonic acids, and substituted sulfonic acids. This was followed by an experimental program wherein the vapor pressure, wetting characteristics, electrical conductivity, chemical stability, and electrochemical stability of specific compounds were measured. The following compounds (acids) were among those evaluated: dichloroacetic, d1-10-camphor sulfonic, heptafluorobutyric, ethanedisulfonic, sulfosalicyclic, benzenesulfonic, 1,3,6 - napthalene trisulfonic, sulfosuccinic, sulfopropionic, methanedisulfonic, propanesulfonic, methanesulfonic, ethanesulfonic, and sulfoacetic. Most attention was given to the last three acids. The electrochemical behavior of methanesulfonic acid, ethanesulfonic acid, and sulfoacetic acid as fuel cell electrolytes was studied in half cells at various temperatures. The rate of the electro-oxidation of hydrogen at 115 C was very high in methanesulfonic acid and sulfoacetic acids. The rate of the electro-oxidation of propane in methanesulfonic acid and ethanesulfonic acid at 80 C and 115 C was low.

25662 **(AD-A—090377) The adsorption and electrooxidation of simple hydrocarbons for direct oxidation hydrocarbon-air fuel cells.** Coleman, A.J. (Army Mobility Equipment Research and Development Command, Fort Belvoir, VA (USA)). Jun 1980. 13p. NTIS, PC A02/MF A01.

The development of new and more sophisticated tactical weapon systems mandates that reliable electrical power sources are also available. The ideal tactical power source should be silent, lightweight and mobile. A fuel cell system would meet these requirements. Hydrogen-air fuel cells are now being considered for deployment for the near future. In order to obtain hydrogen rich mixtures for fuels, these fuel cell systems must be equipped with one of the following: hydrogen storage devices, thermal crackers, steam reformers, or partial oxidizers. A direct oxidation hydrocarbon-air fuel cell would be more attractive, since it would eliminate the above items and result in a lighter, less complex system. A fuel cell system, which would operate interchangeably on a variety of fuels, would be added benefit. This report describes the research effort at MERADCOM to develop such a system. The overall objective is to provide the basic information required for the development of a direct oxidation hydrocarbon-air fuel cell.

25663 **(DOE/CS/20215—T1) Fuel-cell case study. Final report.** (Carnegie-Mellon Inst. of Research, Arlington, VA (USA). Energy Conservation Policy Center; McKinsey and Co., Inc., New York (USA)). 14 Aug 1978. Contract AC02-79CS20215. 58p. NTIS, PC A04/MF A01.

The intent of this study was to determine how DOE could build on the lessons learned from a case study of a particular technology program to develop new ways to manage its programs to commercialization. The Department of Energy's (DOE) 40 kw fuel cell commercialization program is assessed, and a number of conclusions to guide its direction are developed. The specific approach used is then extended to a general management concept or model.

25664 **(DOE/ET/11304—T12) High temperature molten carbonate fuel cells. Technical progress report, January-March 1979.** (Energy Research Corp., Danbury, CT (USA)). May 1979. Contract AC02-76ET11304. 111p. NTIS, PC A06/MF A01. Order Number DE81025228.

A pilot size (1500 cm^2) cell was assembled and tested this quarter with lightweight hardware. This cell reproduced the performance of a similar intermediate size (300 cm^2) cell. A power output of 120 W was achieved at 120 mA/cm^2 and 0.75 V. Progress in this and other task areas is reported. Component development, cell testing, stack design and development, and modeling and system analysis are reported. (WHK)

25665 **(DOE/ET/17019—3) Development of molten carbonate fuel-cell power plant. Quarterly technical progress report, August 1, 1980-October 31, 1980.** (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). 3 Jun 1981. Contract AC02-80ET17019. 168p. NTIS, PC A08/MF A01. Order Number DE81024470.

The major objective of the program for development of a Molten Carbonate Fuel Cell Power Plant is to establish and demonstrate readiness for fabrication and test of full-scale prototype stacks. Coal-fired utility central station and industrial cogeneration power plant requirements will be defined and plant options evaluated, leading to selection of a single reference design. Cell and stack design and development will be guided by requirements based upon the reference plant design. The specific program objectives derived from the contract work statement are as follows: (1) to define a reference power plant design for a coal-fired molten carbonate power plant; (2) to develop and verify cell and stack design based upon the requirements of the reference power plant design; (3) to establish and demonstrate readiness to fabricate and test full-length stacks of full-scale cells, hereafter called prototype stacks; and (4) to quanitify contaminant effects and establish a program to verify performance of molten carbonate fuel cells operating on products of coal gasification. Progress is detailed. (WHK)

25666 **(DOE/NASA/0126—1) Cost projections for redox energy-storage systems. Final report, April 30, 1979-September 30, 1979.** Michaels, K.; Hall, G. (United Technologies Corp., South Windsor, CT (USA)). Feb 1980. Contract AI04-80AL12726. 95p. (NASA-CR—165260; FCR—1784). NTIS, PC A05/MF A01. Order Number DE81024276.

The specific objectives of this study were to establish Redox Energy Storage System conceptual production designs, estimate production cost, and establish the influence of various parameters on production cost. A conceptual design and cost estimate was prepared for each of two energy storage applications: (1) an electric utility 100-MWh requirement (10 MW for 10 hours) for energy storage for utility load leveling application, and (2) a 500-kWh requirement (10 kW for 50 hours) for use with a variety of residential or commercial applications, including stand-alone solar photovoltaic systems. The conceptual system designs were based on cell performance levels, system design parameters, and special material costs supplied by NASA early in the study. Results show the Redox cell stack to be amenable to mass production techniques with a relatively low material cost. Specific cost is estimated to be \$12.50 to \$13.00/ft^2 which translated to \$5.60/kWh for the 500 kWh application and \$13.04/kWh for the shorter discharge time 100 MWh mission. In both cases the cell stack cost is a minor factor in total estimated cost. In both applications, system cost is dominated by the cost of the reactants, electrolyte, and associated tankage. (WHK)

25667 **(DOE/NASA/0201—2) Evaluation of distributed gas cooling of pressurized PAFC for utility power generation. Second quarterly report, December 1980-February 1981.** Farooque, M.; Hooper, M.; Maru, H. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center; Energy Research Corp., Danbury, CT (USA)). Mar 1981. Contract AI01-80ET17088. 17p. (NASA-CR—165303). NTIS, PC A02/MF A01.

The objective of this program is to provide a proof-of-concept test of a gas-cooled pressurized phosphoric acid fuel cell (PAFC). After initial feasibility tests in shorter stacks, two 10 kW stacks will be tested. Significant progress includes completion of design of the test stations with a recirculating gas-cooling loop and atmospheric testing of the baseline stack. Results are presented and discussed.

25668 **(DOE/NASA/6229—2) Non-noble catalysts and catalyst supports for phosphoric-acid fuel cells. 2nd quarterly report, December 1980-February 1981.** McAlister, A.J. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center; National Bureau of Standards, Washington, DC (USA). Metallurgy Div.). 11 Mar 1981. Contract AI01-80ET17088. 19p. NTIS, PC A02/MF A01. Order Number DE81024393.

Tungsten carbide, which is known to be active for hydrogen oxidation and CO tolerant has a hexagonal structure. Titanium carbide is inactive and has a cubic structure. Four different samples of the cubic alloys W/sub x-1/Ti/sub x/C/sub 1-y/ were prepared and found to be active and CO tolerant. When the activities of these cubic alloys are weighted by the reciprocal of the square of the W exchange, they display magnitudes and dependence on bulk

C deficiency comparable to those of highly active forms of WC. They may, therefore, offer important insight into the nature of the active sites on, and means for improving the performance of, W-C anode catalysts for use in phosphoric acid fuel cells.

25669 **(DOE/NASA/12726—8) NASA preprototype redox storage system for a photovoltaic stand-alone application.** Hagedorn, N.H. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. Contract AI04-80AL12726. 12p. (NASA-TM—82607; CONF-810812—19). NTIS, PC A02/MF A01. Order Number DE81023797.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A 1-kW preprototype redox storage system has undergone characterization tests and has been operated as the storage device for a 5-kW (peak) photovoltaic array. The system is described and performance data are presented. Loss mechanisms are discussed and simple design changes leading to significant increases in efficiency are suggested. The effects on system performance of nonequilibrium between the predominant species of complexed chromic ion in the negative electrode reactant solution are indicated.

25670 **(LA-UR—81-1054) Design considerations for vehicular fuel cell power plants.** Lynn, D.K.; McCormick, J.B.; Bobbett, R.E.; Srinivasan, S.; Huff, J.R. (Los Alamos National Lab., NM (USA)). 31 Mar 1981. Contract W-7405-ENG-36. 14p. (CONF-810812—7). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Fuel cells show great promise as an efficient, nonpolluting vehicular power source that can operate on nonpetroleum fuel. As with other power sources, design tradeoffs can be made that either improve vehicle performance or reduce the size and cost of the fuel cell power system. To evaluate some of these tradeoffs, a number of phosphoric acid fuel cell power plant designs have been studied to determine the performance level they would provide, both for a compact passenger vehicle and a 40-ft city bus. The fuel is steam reformed methanol. The analyses indicate that 1978 fuel cell technology can provide a 22 to 50% improvement in fuel economy over the 1980 EPA estimate for the conventionally powered General Motors X car. With this technology the city bus can meet the DOT acceleration, gradability, and top speed requirements. A reasonable advance in fuel cell technology improves performance and fuel consumption of both vehicles substantially.

25671 **(LBL—12754) Characteristics of an NH_3-air fuel cell system for vehicular applications.** Ross, P.N. Jr. (Lawrence Berkeley Lab., CA (USA)). May 1981. Contract W-7405-ENG-48. 9p. (CONF-810812—20). NTIS, PC A02/MF A01. Order Number DE81023245.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The use of hydrogen air alkaline fuel cell in a consumer vehicle application is examined. Liquid anhydrous ammonia was found to be an excellent storage medium for hydrogen, even though the endothermicity of the NH_3 cracking reaction results in some efficiency penalty. In the system developed here, hydrogen is supplied to fuel cell by the catalytic cracking of liquid anhydrous ammonia, making the total system an indirect NH_3-air fuel cell system. The advantages of the alkaline fuel cell system relative to any acid fuel cell are higher power density (factor of 2 to 3) and lower cost components (factor of 2) resulting in significantly lower total cost (factor of 4 to 6). Laboratory scale examinations were made of the ammonia cracking reaction and the power characteristics of an alkaline fuel cell running on cracked ammonia and air. Single cell testing indicated system thermal efficiencies of 34 to 44% (based on H.H.V. of NH_3) can be achieved at power densities of 2600-1000 W/m^2 using currently known electrode technology. In a vehicle application, diesel ICE equivalent performance (30 W/kg) can probably be achieved using only fuel cell power with an estimated fuel cell component cost of less than $2400 (for 50 KW peak power). The primary energy consumption rate (highway cruising) is projected to be only 0.5 kWh/km with natural gas taken as the primary fuel.

25672 **(PB—81-113672) Fuel cell support studies: on-site molten carbonate systems. Final report 1 Dec 78-30 Nov 79.** Bowman, R.M.; Jody, B.J.; Lu, K.C.; Blurton, K.F. (Institute of Gas Technology, Chicago, IL (USA)). Oct 1980. Contract GRI-5011-344-0092. 214p. NTIS, PC A10/MF A01.

The scope of this program as defined by GRI is a preliminary evaluation of the potential energy savings which could be obtained from industrial cogeneration using molten carbonate fuel cells. A natural gas-fueled molten carbonate fuel cell system was configured, and its efficiency and the quantity and quality of its rejected heat were calculated. Potential energy savings, environmental benefits, and impact on overall gas consumption from using the system in a cogenerative mode in 13 selected energy-intensive industries were also determined. In addition, general equations were derived for the calculation of potential energy savings using any cogeneration system. The major results of the program are: The energy savings for the 13 selected industries are in the range of 30% to 50%, and the natural gas utilizations are in the range of 60% to 80%. These savings were obtained with a moderate increase in the overall gas consumption. The environmental benefits are considerable, and the average emissions are less than 1% of current power plant and boiler emissions.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

25673 (CONF-800272—, pp 6-16) **Energy savings: a competitive hedge.** Poulit, J. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

The French government, in 1974, set up an objective to maintain the level of petroleum imports at 100 million metric tons, about 15 million metric tons lower than in 1973. It is projected, though, that 200 million metric tons will be required by the year 2000. So, replacement of 100 million metric tons will be necessary. The program adopted involves developing new energy sources, including nuclear, and development of energy savings from improved efficiency in all sectors. The energy conservation program being implemented in France is described. (MCW)

25674 **(CONF-7910214—) International Energy Management Conference.** (Department of Energy, London (UK)). 1979. 578p. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Separate abstracts are prepared for 22 papers presented at the 3rd International Energy Management Conference. (MCW)

25675 (CONF-7910214—, pp vp, 30p) **Good housekeeping.** Eastwood, J. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

A description of how energy conservation activities have been pursued by Dudley Metropolitan Boroughs since 1974 is presented. Effective energy management; examples of energy management measures taken in the Borough; and activities that have proven to be especially beneficial are discussed. Additional facts on energy for the Borough are presented in appendices. (MCW)

25676 (CONF-7910214—, pp vp, 30p) **Facts about industrial energy conservation in the United States.** Vaughan, W.A. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

The story of energy conservation in the US with particular emphasis on industry is presented. Then, the energy conservation program in General Motors including organization, plant guidelines, communication and motivation techniques, successful case histories, and some concepts for future savings is described in detail. (MCW)

25677 **Thermal transmission measurements of insulation.** Tye, R.P. (ed.). Philadelphia, PA; American Society for Testing and Materials (1978). 460p. (ASTM-STP—660; CONF-770936—). $39.50.

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

Separate abstracts are prepared for 24 papers presented at the symposium. One paper appeared previously in the DOE Energy Data Base (EDB). (MCW)

25678 **Reference materials for insulation measurement comparisons.** *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 7-29(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The issue: adequate standard materials are not available for thermal conductance measurements in the field of thermal insulations, is addressed. The need, scope, and benefits of solving this problem are detailed. The National Bureau of Standards (NBS) Special Reference Materials category was adopted as a possible solution to this problem. The materials selection criteria, the NBS certification process, and the applicable measurement methods are described. A set of materials identified as potential candidates for insulation measurement comparisons are: air space; high-density molded fibrous glass board; AA glass fiber blanket insulation;glass fiber appliance insulation blanket; silicon rubber; borosilicate glass; closed-cell foam glass; silica aerogel composite block; rigidized silica fiber tile; zirconia fiber board; alumina silicate refractory fiber insulation blanket; mineral rock board; calcium silicate; and powder or loose fill insulation. This list is intended to be a point of departure and its dissemination may stimulate testing to identify potential reference materials.

25679 **Fibrous insulating materials as standard reference materials at low temperatures.** Bertasi, M. (Univ. of Padova, Italy); Bigolaro, G.; De Ponte, F. *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 30-49(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

A model is proposed to describe the thermal behavior of relatively high-density fibrous materials. The theoretical approach is compared with experimental results on glass fiber insulating specimens. The results point out the limits of other oversimplified models and the excessive complexity of other models with respect to the precision of results. The problem of the influence of moisture on measured data is then analyzed starting from a large set of experimental data obtained on specimens in controlled atmospheres.

25680 **Blown cellulose fiber thermal insulations. Part 1. Density of cellulose fiber thermal insulation in horizontal applications.** Bomberg, M.; Shirtliffe, C.J. (National Research Council of Canada, Ottawa, Ontario). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 82-103(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

Results are presented of a study to determine the effects of transport and placement conditions on the initial density of the insulation; establish a standardized method for producing specimens of blown cellulose fiber insulations; investigate the factors that cause the material to settle after placement; and establish a standardized method to produce settlement in the specimens comparable with those found in field studies. A method recommended for producing settlement in the specimens consists of two procedures, one simulating settlement by impact produced on the standardized containers, and the other causing settlement under climatic cycling of the material.

25681 **Blown cellulose fiber thermal insulations. Part 2. Thermal resistance.** Shirtliffe, C.J.; Bomberg, M. (National Research Council of Canada, Ottawa, Ontario). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 104-129(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The thermal resistance of a number of commercial blown loose-fill cellulose fiber thermal insulations measured using the guarded hot plate and heat flowmeter methods, is noted. An equation describing the variation of thermal resistance with temperature, temperature difference, density, and thickness derived from these measurements and, with lesser precision, from the data provided by other investigators is given. The equation does not include the effects of chemical content, moisture content, chemical composition, or structure of the paper particles. The thermal resistance of a layer of insulation was found not to be directly proportional to thickness. The equation for thermal resistance fits the National Research Council of Canada (NRC) data with a standard deviation of less than 3.5% for thickness of 50 to 305 mm.

25682 **Measurement of the thermal resistance of thick low-density mineral fiber insulation.** Degenne, M.; Klarsfeld, S.; Barthe, M-P. (Saint Gobain Industries, Rantigny, France). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 130-144(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

A thermal resistance measuring apparatus equipped with large-size heat flowmeters, which allows thermal measurements on light insulating materials of thickness up to 120 mm is described. The apparatus, using one single specimen, is equipped with a biguarded hot plate and a heat flowmeter. This gives the possibility of performing both relative (with the heat flowmeter) and absolute measurements and of cross-checking the results. The study of some anomalies concerning the calibration constant of the relative measurement apparatus, which is being employed more and more in industrial quality control, is noted.

25683 **Analysis of the applicability of the hot-wire technique for determination of the thermal conductivity of diathermanous materials.** Fine, H.A. (Univ. of Kentucky, Lexington). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 147-153(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The hot-wire technique, used to measure the thermal conductivity of many electrically and thermally insulating materials and the effective thermal conductivity of some diathermanous materials, is described. An analysis of the heat transfer in diathermanous materials is presented which indicates that the method will not give a correct value of the effective thermal conductivity when radiation conduction is of importance. Until an exact solution to this heat-transfer problem is found, an ASTM standard for hot-wire type measurements on diathermanous materials is not recommended.

25684 **Thermal conductivity measurements on high-temperature fibrous insulations by the hot-wire method.** Jackson, A.J.; Adams, J.; Millar, R.C. (Imperial Chemical Industries Ltd., Cheshire, England). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 154-171(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

Equipment has been developed to determine the thermal conductivity of insulating materials, in the temperature range 25 to 1600°C, by the hot-wire method. The method is based on the German draft standard DIN 51046 and on the work of Padgett and Davis at the British Ceramic Research Association (BCRA). The method was applied to measurements on polycrystalline alumina fibers, where the thermal conductivities range from 0.03 to 0.3 W/m K. Details of experiences with the hot-wire method are given and some areas where difficulties were found are indicated. Results are compared with those obtained by parallel-plate methods where possible. The dangers of making such a comparison are indicated, but the agreement between the results obtained by the two different methods gives confidence in their reliability for insulation design.

25685 Thermal conductivity of refractories: working with the hot-wire method. Jeschke, P. (Didier Werke AG, Wiesbaden, Germany). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 172-185(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The German Standard Deutsche Industrie Norm (DIN) 51046 covers the measurement of thermal conductivity of refractories up to 1600°C by the hot-wire method. From the publishing of the first draft in 1979 to issuing the standard in 1976, several round-robin tests and other experimental work have shown that the hot-wire method is safe to use for material up to K = 2 W/m, and under certain precautions may be used up to K = 6 W/m K; the simplified solution of the Fourier differential equation used in the standard can be safely applied if the thermal diffusivity is smaller than a = 0.002 m^2/h; for material with a > 0.02 m^2/h, the recommended measuring time has to be reduced; several recommendations can be given about the type of furnace and measuring equipment and suggestions can be made on how to avoid errors; and the hot-wire method produces consistently higher values for thermal conductivity than other methods, including the ASTM procedure.

25686 Determination of the thermal conductivity of refractory insulating materials by the hot-wire method. Davis, W.R. (British Ceramic Research Association, Stoke-on-Trent, England). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 186-199(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The hot-wire line source technique, applied to the measurement of the thermal conductivity of refractory insulating materials at temperatures up to 1000°C, is described. The method is rapid and has a repeatability of better than 5%. Comparisons are made with other methods.

25687 Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations. Dechow, F.J.; Epstein, K.A. (Dow Chemical Co., Granville, OH). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 234-260(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The moisture performance characteristics of various thermal insulations under laboratory conditions and under actual field conditions are reported. The various moisture effects, such as freeze-thaw cycling in the presence of water, water absorption, and water vapor transmission, which occur in insulations in upside-down roof systems and below-grade applications, reduced the thermal efficiency of all insulations tested. This loss of thermal resistance of the common insulating materials using both laboratory methods and field data is related to the volume of water present in the insulations. The minimum performance criteria for insulations exposed to the various laboratory test methods and to actual field conditions are also discussed. The insulations investigated include fiber glass, fiberboard, expanded (bead) polystyrene, extruded polystyrene, polyurethanes, and cellular glass. The effect of various top coverings for upside-down roof applications on the thermal resistance performance of insulation is also discussed.

25688 Light transmission measurements through glass fiber insulations. Pelanne, C.M. (Johns-Manville Research and Development Center, Denver, CO). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 263-280(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

As part of a study to define the structure of glass fiber insulations, light transmission was measured through a number of insulations made by different manufacturing processes. A significant relationship was observed between light transmitted normal to the plane of the insulation and the apparent thermal conductivity. This relationship suggests a possible application for the continuous monitoring of glass fiber insulation being manufactured. The light transmission measurement allows laminar structure of glass fiber insulations to be seen as well as the preferred orientation of the fibers resulting from manufacturing process characteristics. The light transmission measurements also may provide an indirect way of estimating the apparent thermal conductivity in the plane of the insulation, as well as a way of evaluating heat flow in tailor-made glass fiber specimens.

25689 Fibrous insulation heat-transfer model. King, C.R. (Eagle Picher Industries, Inc., Joplin, MO). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 281-292(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

A mathematical model is developed for the transfer of heat through fibrous insulating materials. The mathematical derivation of the model based upon fundamental concepts of heat transfer and certain simplifying assumptions is described. It is shown that the efficiency of a fibrous insulation may be characterized by three model constants. One constant is calculated from fiber emissivity data and the other two may be determined from measurement of the apparent thermal conductivity at two different temperatures by the ASTM Test for Steady-State Thermal Transmission Properties by Means of the Guarded Hot Plate. Actual test data are included to indicate the model's validity throughout the temperature ranges of practical interest for the materials investigated. In one form, the model may be used to estimate the apparent thermal conductivity of a material for various combinations of hot-face and cold-face temperatures. The model may also be used to calculate heat losses and corresponding temperature profiles through insulated systems under known or assumed boundary conditions without relying upon the concept of mean temperature.

3201 Buildings

REFER ALSO TO CITATION(S) 25324, 25325, 25338, 25342, 25344, 25362, 25365, 25366, 25380, 25610, 25783, 25787, 26164, 26194, 26202

25690 (BNL—51299) Evaluation of the conservation potential of a refit energy management system (using a power line subcarrier) in a large, high-rise apartment complex. Hirschfeld, H.E. (Brookhaven National Lab., Upton, NY (USA)). Apr 1980. Contract AC02-76CH00016. 129p. NTIS, PC A07/MF A01. Order Number DE81023856.

An innovative energy conservation system was originally installed in one of two almost identical apartment towers to provide the basis for a comparison study of the energy used by the apartments in the equipped versus the unequipped tower. After over one year of operation, the second tower was equipped with a similar energy conservation system as part of this ongoing energy conservation program at Manhattan Plaza. The comparison phase of this program is described and evaluated in this study. The objectives established for this study include: (1) the investigation of an energy conservation system which presents an alternative to submetering as a method of energy conservation, (2) the demonstration of a new application of existing technology (power line subcarrier, ripple control) to implement energy conservation, (3) the development of various control strategies required to successfully implement energy conservation, and (4) the development of a marketing field test of this innovative energy conservation system to encourage marketing acceptance of energy conservation controls.

25691 (CONF-800277—) Building energy-performance-standards conference: Proceedings. Strategy paper number 12. (Bendixen Associates, Boston, MA (USA)). 1980. 245p. NTIS, PC A11/MF A01. Order Number DE81021782.

From Building energy performance standards conference; Boston, MA, USA (21 Feb 1980).

A certified transcript of the proceedings in the matter of building energy performance standards is presented. Ten presentations were delivered in a panel mode. The conference brought together persons impacted by the standard and persons responsible for overseeing the implementation of the standard. The issue is examined from the perspective of New England and how the standard can be changed to most accurately reflect the needs and concerns of that particular region.

25692 **(CONF-800438—) Earth shelter 2. 1979-1980 USC Series.** (Minnesota Univ., St. Paul (USA). Underground Space Center). 1980. 236p. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

Separate abstracts are prepared for 22 papers presented at the conference and exhibition. One paper had previously appeared in the appropriate DOE Energy Data Base. (MCW)

25693 (CONF-800438—, pp 1-4) **Detailing the earth sheltered building.** Wright, R.; Wright, S. (Hawkweed Group, Ltd., Osseo, WI). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

A general discussion on all design aspects of an earth-covered building is presented. Experiments of building earth-sheltered structures are briefly mentioned. (MCW)

25694 (CONF-800438—, pp 18-21) **Aesthetics of the underground building.** Metz, D. 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

A method of looking at the elements of underground buildings that have architecturally expressive potential is proposed. Manipulation of the basics (form, space, and light) of architecture in underground structures is briefly described. (MCW)

25695 (CONF-800438—, pp 22-32) **100% passive solar-heated underground structure.** Allen, J.M. 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

Development of a 100% passive solar greenhouse is discussed. The solar panel and the heat-storage and distribution system are described. Performance of the structure and temperature measurements during the year are detailed. Schematics of the design are included. (MCW)

25696 (CONF-800438—, pp 33-42) **Energy performance characteristics of selected earth sheltered residences.** Bice, T.N.; Boyer, L.L.; Grondzik, W.T. (Oklahoma State Univ., Stillwater). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

The discussion contains three parts. The first includes a description of the houses and an overview of certain design considerations for typical Oklahoma earth-sheltered dwellings. The next portion presents the actual metered energy usage of each sample residence for a full year on a monthly basis. The last section compares the actual metered consumption to a currently accepted energy conservation standard.

25697 (CONF-800438—, pp 43-54) **Oklahoma earth shelters: a state-of-the-art review.** Grondzik, W.T.; Boyer, L.L. (Oklahoma State Univ., Stillwater). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

In the course of an on-going research project, over 80 earth-sheltered residences in Oklahoma were identified and investigated via a detailed questionnaire procedure. The questionnaire and subsequent analyses focused upon three major concerns: building construction parameters, occupant attitudes and evaluations, and energy utilization. The current status of research efforts affords an opportunity for a review of the state-of-the-art with an emphasis on these three issues. Analysis of information assembled to date indicates that earth sheltered housing in Oklahoma is generally successful, although still somewhat experimental in nature. Occupant responses regarding the subterranean environment are overwhelmingly positive. Energy consumption in the structures sampled is representative of a high degree of overall conservation, but does not enter the realm of alternative energy advocacy or optimization.

25698 (CONF-800438—, pp 55-63) **Integrating site locational criteria for underground housing.** Hannula, J.K. (Univ. of Georgia, Athens). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

Site-location criteria and mapping processes for underground housing on a large-scale basis are discussed. Orientation, vegetation, soil, depth to bedrock and to water table, weight, and utility factors are considered. (MCW)

25699 (CONF-800438—, pp 64-71) **Owner-builder and the underground: building a low-cost home.** Roy, R.L. (Wood, Wind, and Earth, Inc., West Chazy, NY). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

The availability of technology and the price of underground construction are discussed in order to dispel myths about the lack of proven technology and high costs of underground structures. (MCW)

25700 (CONF-800438—, pp 94-100) **Expression of earth sheltered architecture.** Wampler, M.S. (Univ. of Arkansas, Fayetteville). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

Roots of architectural expression are discussed briefly. Historical illustrations of earth-sheltered architecture are given and examples of strong expression in the modern movement are noted. Design of an earth-covered church in Fort Smith, Arkansas is briefly reviewed. (MCW)

25701 (CONF-800438—, pp 101-125) **Shelterra earth homes structural shell and other general observations.** Ohanian, R. (Shelterra Earth Homes, Springfield, OH). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

The specifics of precast roof and poured wall systems for an earth-covered structure and lighting quality in such a structure are described. Conformance with building codes and the simplicity of the mechanical systems are discussed. Costs for the shell are indicated at $18.50 to $23.50 with finishing cost amounting to $16.50 to $20.50, for a total of about $40 per square foot. Slides were presented showing 5 completed homes. (MCW)

25702 (CONF-800438—, pp 12-132) **High bank instead of high rise.** Thorsen, G.W.; Rue, R.L. 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

The conventional form of residential development on slopes is briefly reviewed and then an alternative is proposed for development of steep slopes. Essential points of the High Bank Residential Complex discussed are: utilization of steep slopes (35° or greater); continuous use of the length of the slope; earth sheltering of the structure; and standardization of the units. Energy matters, safety, aesthetics, liveability, and site analysis are briefly noted. (MCW)

25703 (CONF-800438—, pp 133-139) **Potential problems of legal liability in the design, construction and ownership of an earth shelter.** Ziebarth, A.M. (Earth Shelters, Inc., Omaha, NE). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

Some of the potential problems of legal liability and their practical effect regarding the design, construction, and ownership of an earth-sheltered residence are discussed. Landscaping, structural engineering, waterproofing and insulation, the builder, and home tours are discussed. (MCW)

25704 (CONF-800438—, pp 155-160) **Restrictive covenants: a barrier to earth sheltering.** Ziebarth, A.M. (Earth Shelters, Inc., Omaha, NE). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

Restrictive covenants and their impact on earth sheltering to help the prospective earth shelter designer and builder avoid the problems with restrictive covenants are examined. Covenants re-

strictions affecting earth-covered buildings have not been tested in court, but assumptions are made about difficulties that may be encountered. Recommendations are offered for prospective owners of earth-covered shelters. (MCW)

25705 (CONF-800438—, pp 161-171) **Steel reinforced concrete shell structures: forming techniques, structural design, and earth sheltered applications.** Sullivan, M. 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

Details are given of the actual construction process of a 6.1 meter in diameter ellipsoid constructed of steel reinforced concrete, covered by no less than 20 cm of earth and sod on top and no more than 1.5 m on the side. The forming techniques, structural design, and applications are discussed. The advantages of this structural system are indicated. (MCW)

25706 (CONF-800438—, pp 172-176) **Earth shelters by inflation formed thin shell domes.** Hull, M. 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

The use of inflatable form moulding of thin shell concrete domes for earth-sheltered construction is discussed. A method, which is patented, for constructing such a structure is presented. The advantages of this structural method are described. Features are noted to be that: the inflatable form is light weight; the form can be erected by 2 men; the form is reusable; the cost per use is low; and the form is adaptable to a wide range of structure sizes and shapes. (MCW)

25707 (CONF-800438—, pp 177-184) **Earth shelter design revival: who's building what, where.** Vadnais, K. (ed.). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

The utilization of the earth as a place for shelter is addressed. Interest in earth-shelters viewed from the standpoint of a journalist is given. Interest specifically in printed material and conference on earth shelters is noted. Proposed earth-sheltered townhouses in Minnesota drew much interest and financial institutions are beginning to show response to finance such purchases.

25708 (CONF-800438—, pp 187-188) **Selling earth sheltered homes.** 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

Efforts are described to market 12 earth-sheltered townhouses in Minnesota. Features of the townhouses include active solar systems to assist in heating the homes and to preheat domestic water. Economic factors are briefly noted.

25709 (CONF-800438—, pp 198-214) **Precast concrete walls for earth sheltered construction.** Lunde, M.R. 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

Wall structural systems for earth-covered buildings are analyzed and the results of the analysis point toward use of precast concrete wall ponds for residential below-grade wall construction when compared with reinforced concrete block, wood, and cost in-place concrete construction techniques. The advantages and disadvantages of the various techniques are summarized.

25710 **(CONF-810672—10) Demonstration of a heat-pump water heater.** Blevins, R.P. (Oak Ridge National Lab., TN (USA); Energy Utilization Systems, Inc., Pittsburgh, PA (USA)). 1981. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE81024085.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

A demonstration program to test the reliability and operating efficiency of a residential heat-pump water heater (HPWH) is described. The demonstration provided a total of 643 unit-months (85 prototypes installed) of useable operational data which showed an average COP of 1.93, or an average 48% operating savings compared to resistance water heating. Average operating conditions were 73 gallons of 140°F water consumed each day with an average inlet water temperature of 61°F and an average ambient air temperature of 71°F. Consumer reaction to the system was extremely positive. The data suggest that the HPWH would save the average consumer in the test program 2917 kWh per year. Measurable impacts on heating/cooling systems were detected in only 8% of the test homes. Based on early results of the field-demonstration program, Energy Utilization Systems, Inc. committed itself to commercialization of the system and is now manufacturing and distributing these HPWHs under the brand name TEMCOR.

25711 **(CONF-810672—16) Annual cycle energy system.** Minturn, R.E. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE81024911.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

The ACES program incorporates in a practical system the outstanding energy conservation potential that exists when the unidirectional heat pump and the interseasonal storage of energy are combined to provide heating, cooling, and domestic hot water to buildings. Information on the system, its applicability to different geographic areas, and the methodology for designing and building such systems is to be made freely available to the private sector. An ACES has been designed, constructed, and field tested over a three-year period in a fully instrumented residential test complex near Knoxville, Tennessee. During that period, the system has been shown to be rugged, reliable, and appreciably more conservative of purchased energy than all practical alternatives. An ACES residential design methodology has been developed and published, and the performance characteristics of ACES and several alternative systems have been analytically estimated for 115 US cities. The ACES has a relatively high first cost, but its life-cycle costs at present day electricity rates are competitive with those of other systems with the exception of those using natural gas. The ACES, however, offers some load management features that may be economically attractive to a number of electric power utiliites. Its constancy in efficiency and capacity during winter operation, independent of extremes in weather, contributes to the reduction of peak demand and to increases in daily and seasonal load factors. Its significant reduction in summer demand may be a boon to utilities encumbered by summer peaking problems and low reserve margins.

25712 (CONF-7910214—, pp vp, 19p) **Energy management systems in buildings.** Lush, D.M. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

An investigation is made of the range of possibilities available from three types of systems (automatic control devices, building envelope, and the occupants) in buildings. The following subjects are discussed: general (buildings, design and personnel); new buildings (envelope, designers, energy and load calculations, plant design, general design parameters); existing buildings (conservation measures, general energy management, air conditioned buildings, industrial buildings); man and motivation (general, energy management and documentation, maintenance, motivation); automatic energy management systems (thermostatic controls, optimized plant start up, air conditioned and industrial buildings, building automatic systems). (MCW)

25713 (CONF-7910214—, pp vp, 25p) **Energy management in a commercial organization.** Huxley, C.W. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Implementation of energy management programs by the Debenhams Group, operators of a chain of department stores in England, Scotland, and Wales, is discussed. How the systems relate to building operations is considered in the following subjects: group activities and energy costs; energy management; information base; standards action; lighting and energy; new store design; development (control of services). (MCW)

25714 (CONF-7910214—, pp vp, 18p) **Practical energy auditing.** Jones, C.D.E. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Graphs are shown depicting energy consumption over a period to illustrate the impact various factors have on energy consumption. Some recommendations are made to improve consumption including weatherization of the building; proper operation of equipment; and insulating pipelines, etc. Formulas are given from which can be determined the factors (seasonal variations, heat losses, etc.) causing fuel consumption variations. Electric power usage for space HVAC systems and for processes is dealt with separately and can usually be audited separately. Some payback times for specific conservation measures are given. (MCW)

25715 (CONF-7910214—, pp vp, 16p) **Economic and technical facts and developments in the field of energy in German industry.** Rolshoven, H. (VDI Energy Technology Society, Duesseldorf, Germany). 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

A review of the energy situation with regard to energy management and technological developments in Germany is presented. It is observed that the industrial consumption of energy is considerably lower than that of households and authorities of all kinds, leading to the conclusion that the greatest scope for saving on energy raw materials, particularly oil, lies in the area of households and small consumption areas. Some data and measures for conservation in the five most energy-intensive industries are briefly discussed. Examples of the national use of energy are given. (MCW)

25716 (CONF-7910214—, pp vp, 13p) **Energy auditing and monitoring in local authorities.** Johnson, D. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

An energy audit, relating the individual energy performance to the building structure and usage after discounting the effects of variation in weather and then measuring on a continuing program the actual energy usage, is described. A list of measures that can reduce the cost of energy is presented. The actual auditing and monitoring may be carried out by either a manual system using specially prepared record cards or a computer system. Details of these systems and their implementation are described. (MCW)

25717 **(DOE/CE/20184—1) Comparison of load determination methodologies for building energy-analysis programs. Final report.** (USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC). Jan 1981. 158p. NTIS, PC A08/MF A01.

The consistency and accuracy of computer programs to assess how much confidence government policymakers and HVAC system engineers can place in computer estimates of building energy requirements is being checked. Specifications of some typical buildings are used to compare various computer program results. Participants found that the different methodologies used to calculate building energy loads can produce very different estimates of both annual heating and cooling loads and peak hourly loads. In Chapter 1, the observed estimates are summarized with the magnitude of differences that arise indicated. In Chapter 2, it is shown that many of these differences can be explained by the methodology used to simulate the interior thermal and radiation exchange. In Chapter 3, the differences caused by using predetermined values to simulate this interior thermal and radiation exchange instead of calculating them for the specific building being analyzed are examined. In Chapter 4, differences that can arise because of different assumptions about interior film coefficients are examined. Conclusions on these efforts are presented and directions for further work are suggested in Chapter 5.

25718 **(DOE/CS/10220—T1) Project Monitor: Part II. Conservation in small business: an exploratory study. Final report.** Hammond, P.Y. (Pittsburgh Univ., PA (USA). Research Inst. for Energy Policy). Aug 1979. Contract AC01-77CS10220. 60p. NTIS, PC A04/MF A01.

Project Monitor examined the energy conservation attitude and behavior of small samples of small business owners/operators in Allegheny County, Pennsylvania, focusing on manufacturing concerns and retailers. Section I reports the findings on the energy conserving behavior of 92 smaller manufacturers and Section II identifies the factors which affect decision making concerning energy consuming activities by the owners/operators of 94 small retail establishments. In each, the impact of Project Pacesetter and of the coal strike and the general energy situation is considered. (MCW)

25719 **(DOE/CS/20315—T11) Energy-efficiency directory of refrigerators and refrigerator-freezers.** Statt, T.G.; Coggins, J.L. (Energy Applications, Columbia, MD (USA)). Jun 1981. Contract AC03-79CS20315. 33p. NTIS, PC A03/MF A01.

Information is presented about the energy costs of operating refrigerators and refrigerator-freezers and includes the type of refrigerator or refrigerator-freezer, the fresh food volume, the freezer volume, the total volume, and the yearly energy cost. The directory lists all currently marketed electric refrigerators and refrigerator-freezers that have Energy Guide labels. The Federal Trade Commission requires manufacturers who distribute refrigerators and refrigerator-freezers to attach Energy Guide labels to appliances manufactured on or after May 19, 1980. The data have been measured by manufacturers and/or their agents according to US Government standard test procedures.

25720 **(NBSIR—80-2145(DOE)) Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980.** Tu, K.M.; Davies, A.; Fischler, S. (Oak Ridge National Lab., TN (USA); National Bureau of Standards, Washington, DC (USA)). Feb 1981. Contract W-7405-ENG-26. 77p. NTIS, PC A06/MF A01. Order Number DE81025778.

Three integrated heat-pump - heat-recovery-unit - water-heater appliances were tested under various environmental conditions to measure the functional parameters and study the operating characteristics of these systems. It was found that the heat recovery, heat-recovery rate, and heat-recovery efficiency were dependent on the heat-recovery-unit's characteristics. The use of the heat-recovery unit in the system resulted in a reduced work load for the heat pump's compressor and slightly improved the heat-pump's performance. A computer simulation model of the integrated system was developed to study the interactions between several of the pertinent system variables on an hourly basis for selected situations and to estimate energy savings. Two alternative estimation methods that utilize five-degree temperature bin data were also developed. The estimate savings determined by using the alternative methods were about the same as those estimated using the hourly data. Conclusions were also reached concerning the use of water heaters with different tank capacities and on methods of increasing potential energy savings.

25721 **(ORNL-SUB—78/86993/1) Performance characteristics of foamed-in-place urea formaldehyde insulation.** Tye, R.P.; Desjarlais, A.O. (Dynatech R/D Co., Cambridge, MA (USA)). Jun 1981. Contract W-7405-ENG-26. 44p. NTIS, PC A03/MF A01. Order Number DE81023867.

A program designed to describe some of the stability problems of foamed-in-place urea formaldehyde is described. A stud wall was fabricated for the preparation of sample material to provide the test specimens to be used in the study of dimensional stability and compressive properties as a function of environmental conditioning. The testing procedure and results are discussed. (MCW)

25722 **(PB—81-105736) Tests for thermal efficiency of dwellings. Final report.** Bar-Cohen, A.; O'Hare, M.; Allen, E. (Massachusetts Inst. of Tech., Cambridge (USA). Lab. of Architecture and Planning). Dec 1979. 90p. NTIS, PC A05/MF A01.

Several techniques exist by which the thermal efficiency (resistance to heat loss) of houses can be determined cheaply enough to make it worthwhile to do so for every house sold. New houses are best tested by visual inspection before finish installation

combined with computer heat loss calculations, and existing houses by fuel and utility audits of several alternative types. Other techniques, including inference of a transfer function from an imposed step-function change in interior temperature, and tracer gas infiltration assay, are under development and promise applicability in a few years.

25723 **(PB—81-106940) The impact of residential energy conservation standards on credit markets.** Tuccillo, J. (Urban Inst., Washington, DC (USA)). Jun 1980. Contract HUD-H-2882. 64p. NTIS, PC A04/MF A01.

The paper is one report of a series dealing with the institution of energy conservation standards. It analyzes the impact on domestic credit markets and arrangements of a mandatory residential energy standard which would be imposed when properties are sold or exchanged. The investigatory approach consists of three questions: (1) the identity of those effects by the point of sale imposition of energy conservation standards; (2) the identity of the sources of financing of retrofitting costs, including incorporating these costs in the mortgage home improvement loans, Federal grants for retrofitting; and (3) the impact of financing retrofitting costs on credit markets.

25724 **(PB—81-113656) Research, development, and demonstration of a high-efficiency gas fired water heater. Final report 1979-80.** Zawacki, T.S.; Zimmer, J.W.; Macriss, R.A. (Institute of Gas Technology, Chicago, IL (USA)). Oct 1980. Contract GRI-5011-345-0093. 90p. NTIS, PC A05/MF A01.

Analyses of 'losses' and evaluation of methods and existing concepts that can increase 'seasonal use-efficiency' of gas-fired water heaters were carried out in this study. A staged program approach for the development of a 'near-term' high-efficiency, residential, storage water heater, and of a 'long-term', condensing-flue, higher efficiency water heater, was also selected, based on results of analyses and evaluations. A new-design, 55-gallon, storage water-heater prototype, incorporating a conical-flue (to increase heat transfer area), a companion turbulator (to increase heat transfer rate), a new urethane foam insulating jacket (to decrease standby losses), and a stamped low NOx atmospheric burner, was designed, constructed and tested in the labratory. Recovery efficiency over 78.4 percent, standby loss rate of 2.8 percent per hour, and energy factor of 0.55 were obtained with the prototype, when tested in accordance with DOE reference procedure for storage water heaters, at a burner input of 50,000 Btu per hour, demonstrating a 25 percent reduction in gas-energy consumption compared to pre-1979 commercially available equipment. A preliminary conceptual design study of a new hybrid water heater was also undertaken, because of its potential for even higher efficiencies.

25725 **(PB—81-114530) Swedish heat pump projects 1979: research, development, full-scale experiments.** Eklund, S. (Swedish Council for Building Research, Stockholm). 1979. 402p. NTIS, PC A18/MF A01.

This catalogue of projects is a compilation of the heat pump projects being carried out with governmental grants and/or loans. Only projects which are involved in research work are listed: heat pump installations subsidized in some way, for general energy conservation rather than research, are not included.

25726 **(SAI—026-79-855-LJ) Background document for the advanced notice of proposed rulemaking for dishwashers, television sets, clothes washers, humidifiers and dehumidifiers. Topical report subtask 1.1: consumers products minimum energy efficiency standards program.** (Science Applications, Inc., La Jolla, CA (USA)). 14 Sep 1979. Contract AC03-78CS20329. 47p. NTIS, PC A03/MF A01. Order Number DE81025624.

This report documents the work performed in developing the Advanced Notice of Proposed Rulemaking for Four Products, namely dishwashers, television sets, clothes washers and humidifiers and dehumidifiers. The technical portion of the advanced notice is presented in Section 1. Section 2 presents the background data used to generate the preliminary maximum technologically feasible energy efficiency levels presented in Table II of Section 1. The format of Section 2 is suitable for submittal to the DOE Freedom of Information Office. Section 3 gives comments on the calculations performed to generate the preliminary maximum technologically feasible energy efficiency levels and recommendations for proposed standards and DOE test procedure modifications.

25727 **(SAI—026-79-858-LJ) Minimum energy efficiency standards for ranges and ovens. Topical report, subtask 2.1.** (Science Applications, Inc., La Jolla, CA (USA)). 15 Sep 1979. Contract AC03-78CS20329. 155p. NTIS, PC A08/MF A01. Order Number DE81025230.

This report is an assessment of the implementation of minimum energy efficiency standards on kitchen ranges, cooktops, ovens, and microwave ovens. These products are classified additionally by type of energy source (gas or electricity), and in the case of conventional ovens, classified as either standard, (including continuous clean) or self-cleaning (pyrolytic self-cleaning). The methodology used to make this assessment involved the evaluation of further design improvements in terms of technical feasibility and efficiency improvement (Section 2.0); the added cost to the appliances due to the incorporation of these design improvements (Section 3.0); and the additional cost incurred by appliance testing (Section 4.0). The results of these sections were then used to determine the costs and benefits of each design improvement utilizing the methods outlined in Section 5.0. Results and discussions of this analysis are included in Section 6.0 and a final recommendation is made in Section 7.0.

25728 **(UT/CES-PS—16) Urban revitalization and displacement: types, causes, and public policy.** Feagin, J.R. (Texas Univ., Austin (USA). Center for Energy Studies). May 1981. 70p. NTIS, PC A04/MF A01. Order Number DE81903426.

The policy research report reviews the scholarly and print media literatures on urban revitalization. The extent of revitalization; the incumbent or occupant upgrading; gentrification (displacement of low- and moderate-income households by better-off households); gentrification and displacement from all causes; and the role of powerful actors in revitalization are discussed. Public policy dealing with land use and development in urban areas is discussed. Future research needs are indicated.

25729 **Progress in movable blanket insulation systems for greenhouses.** Roberts, W.J.; Mears, D.R.; Simpkins, J.C.; Cipolletti, J.P. (Rutgers Univ., New Brunswick, NJ). *ASAE Publication ;* No. 4-81, 558-561(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

The heat transfer coefficient of an uninsulated greenhouse of 4.59 W/m^2K can be reduced to a value of 1.93 to 3.59 W/m^2K, depending upon the type of material used and the effectiveness of closure of the mechanical system. The open, woven-cloth materials tested offer significant energy savings, handle well mechanically, drain condensate, and have a potential to double as shading materials in the summer. The thermally opaque and air tight materials tested offer significantly increased energy savings, but provision must be provided to drain off condensation if the materials do not self drain. Some of these materials were found somewhat harder to handle and bulkier to store than the open, woven cloth. It has also been shown that aluminizing the upper surface of a curtain can increase heat savings if the edges are well sealed. Also, some opaque and aluminized materials have a potential use for photoperiod control.

25730 **Energy: comparative energy consumption of space and water heating appliances.** Hamilton, G.; Savin, S.J. Luxembourg; Commission of the European Communities (1981). 149p. (EUR—6851-EN).

The program and results of a project to determine the comparative energy consumption of various types of appliances used for domestic space and water heating are presented. The efficiency of the appliance when operating under changing thermal loads typical of conditions in a home was determined. The effect of alternative control systems was also examined. The investigation was confined to space heating systems using low temperature hot water. In such systems either a gas or oil-fired control heating boiler may be used.

The research procedures and facilities are described and calculations of energy consumption of domestic central systems based on the results of the testing program are presented.

25731 **Overview of the Committee-proposed residential building standards.** Sacramento, CA; California Energy Commission (1981). 11p. (NP—1903422).

More than six months ago the Staff of the California Energy Commission released proposed new standards for energy conservation in new residential buildings. Following their release, the Commission Building Standards Committee held a series of public hearings to take comment on the Staff proposal. Builders, architects, utilities, public-interest groups, building officials, local-government officials, solar-system manufacturers, and electric-appliance-industry representatives participated in these hearings. The Committee is now proposing new standards based on both the original Staff proposal and the public input it generated. The Committee estimates that houses built to the new standards will save on estimated 94 billion kWh of electricity and 4 billion therms of natural gas statewide by the year 2000. Energy savings of this magnitude would result in energy cost savings of approximately $8 billion. Electricity savings would be expected to reduce California's need for power plant capacity by approximately 1600 MW in the year 2000, the equivalent of about two typically sized coal or nuclear power plants. In addition, the standards will improve environmental quality, create new jobs, and reduce our dependence on foreign oil.

25732 **Proceedings: earth sheltered building design innovations.** Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980). 227p. (CONF-800449—).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Separate abstracts are prepared for 22 papers presented at the conference. One paper has previously appeared in the appropriate DOE Energy Data Base. (MCW)

25733 **Integrated architectural and mechanical design for the Arizona State University energy efficient house and laboratory.** Burgess, H.; Mumma, S.; Yellott, J. (Arizona State Univ., Tempe). pp II.4-II.10 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

The final design of a two-story solution to simulate a single family home for later conversion to a research laboratory, providing some 1800 ft^2 of building floor area with 900 ft^2 roof area which minimized the cooling requirement contributed by the roof, is described. The solar heat gain to the building envelope is controlled by reduction of glazing. Relatively extensive south-facing glazing is used for direct gain heating in winter, but it is shaded carefully to minimize summer cooling load. Recognizing that earth-integrated architecture further contributes to a reduction in the cooling load, the first floor of the building is designed to be partially below grade. The cross section of the room is rectangular with essentially a one room deep floor plan which allows effective utilization of passive heating solar systems. The 800 ft^2 south wall is modularized to provide a research capability for introducing both active and passive heating systems in future years. The landscape concept, architectural design for energy conservation, the solar/mechanical systems, and energy systems design compatible with electric utilities are discussed. Other specifically discussed items include: interior appointments, solar clothes dryer, and solar oven. (MCW)

25734 **Lithotecture of Australia: with specific reference to thermal factors.** Baggs, D.W. pp II.13-II.17 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Case studies of occupied underground environments regarding cryptoclimatic and architectural survey data are presented. Possible correlations between the ionized state of the contained air and health and anxiety factors are addressed. Results have implications for lithotecture in the USA. Commencing with a description of the arid region and biophysical environment that comprises the habitat for the lithotecture of Coober Pedy, reference is made to two specific Case Studies of dugouts. Also a third Case Study considers a temperature tautochrone measured at depth within the soil/rock adjoining the dugout in Case Study No. 2. Architectural and thermal characteristics of the Case Study dugouts are discussed within the context of the extreme ambient climatic conditions that prevailed at the time of the survey. Methods of excavation and construction of the lithotecture of Coober Pedy are included.

25735 **Lithotecture of Australia: with specific reference to user health factors.** Baggs, S.A. (Univ. of New South Wales, Sydney, Australia). pp II.21-II.26 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Commencing with a brief historical background to the use of lithotecture in Australia, results are presented that record the ionized state of the air in certain underground dwellings. It is suggested that a relationship exists between the specific ionized air conditions within a dwelling and certain aspects of health and state of anxiety in occupants of underground as well as conventional aboveground dwellings. Also discussed are the effects of sensory deprivation, noise attenuation, and extremes of heat and light intensity upon the health of people who live in arid regions. (MCW)

25736 **Rooftop plantings for earth covered buildings in temperate climates.** Gordon, A. pp III.13-III.16 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

The design of rooftop plantings is considered. The types of plants to use and management of the roofscape are discussed. Recommended uses of the area are a playing field, a park, a garden, or an area planted with wild flora. Advantages of maintaining a compost pile, use of the resultant mulch, and construction of a solar greenhouse are noted. (MCW)

25737 **Simple method for determining heat flow through earth covered roofs.** Blick, E.F. (Univ. of Oklahoma, Norman). pp III.19-III.23 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

A simple method is developed for determining the heat flow through earth covered roofs. It is known that the first six to eight inches of the earth's surface acts as a huge thermal flywheel in that the diurnal fluctuations in temperature are hardly sensed below this level. Below this level the temperature profiles in an earth-covered roof are nearly linear. These facts are used to develop an equation that can be easily used to predict the heat loss through earth-covered roofs in the winter and heat gain in the summer. Comparisons were made with an exact computer solution for a time period of one year.

25738 **Analysis of transient heat loss in earth sheltered structures.** Szydlowski, R.F.; Kuehn, T.H. (Iowa State Univ., Ames). pp III.27-III.37 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

The two-dimensional transient Fourier heat conduction equation is solved in cartesian coordinates using an alternating direction implicit finite difference technique for several earth sheltered building configurations. The computer program is verified by comparing results with data taken from an instrumented conventional residence basement. The present model considers variable soil properties, different types of below grade configurations, and various types, thicknesses, and locations of insulations. The program was used to analyze the thermal impact of varying levels of interior and exterior insulation on conventional basements, earth bermed walls,

and earth covered structures, although results for only the earth covered structures are presented. Heat loss and gain through the exterior building envelope versus location and time of year are given as functions of construction materials, insulation, and soil geometry. Temperature distributions within the building envelope material and in the surrounding soil are presented versus time of year. An economic analysis is also given to indicate the cost effectiveness of the insulation levels analyzed.

25739 **Energy usage in earth covered dwellings in Oklahoma.** Boyer, L.L.; Grondzik, W.T.; Bice, T.N. (Oklahoma State Univ., Stillwater). pp IV.19-IV.31 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Selected earth covered dwellings in Oklahoma were analyzed with respect to energy consumption. The examination process for each residence included consideration of predicted energy consumption calculated by use of standard methodologies, compilation of actual metered energy usage, and derivation of expected energy requirements for a comparable building meeting current energy conservation standards. A comparison was made between the various energy consumption indicators for each location. The predicted values compare extremely well with metered usage except for the mid-winter months. Since typical heating load calculations do not consider the benefits of solar radiation in winter, calculated monthly loads could be expected to be higher than actual measured values. The predicted and metered usages both fall far below the requirements of any prescriptive energy standards currently in nationwide use. Specific long-term on-site monitoring of individual cooling and heating requirements is suggested in order to verify the tentative results.

25740 **Design innovations for a new minerals engineering building.** Green, B.H.; Summers, D.A.; Aughenbaugh, N.B. (Univ. of Missouri, Rolla). pp V.17-V.22 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

The concept development for a new Minerals Engineering Building on the campus at the University of Missouri-Rolla is described. The potentially large advantages of underground construction and the advantage of using available solar energy are discussed, leading to the adoption of an underground construction design. The preliminary planning criteria, the features of the building, the problem of excavating, the practical assessments on the concepts are discussed. Unique to this structure are the plans to use the existing subsurface rock as walls in some areas of the buildings. The use of high pressure water jets as a means of excavating rock is explained. The use of the excavated rock as building materials in the structure is also described. (MCW)

25741 **Incorporating earth shelter considerations into the design process for nonresidential buildings.** Duke, B.W. Jr. (Benham-Blair and Affiliates, Inc., Oklahoma City, OK). pp V.25-V.30 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Non-residential earth sheltered structures have been designed to show a definite relationship between energy conservation and earth shelter. The design of earth sheltered structures also shows environmental considerations and advantages to their surroundings as good neighbors by providing open, green space above their functional mass. Three earth sheltered designs are examined for nonresidential use structures in detail. The structures are primarily for office use and vary in size from 4000 SF to 240,000 SF and are located in three climatic zones. The design process is discussed in terms of the factors, energy conservation, environmental impact, and habitability.

25742 **Absolutely constant incontestably stable architectural value scale.** Wells, M. pp VI.5-VI.8 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

The advantages and satisfaction of living in underground shelters are described. Emphasis is placed on getting back into step with natural systems. The Absolutely Constant Incontestably Stable Architectural Value Scale is shown. A process for the evaluation of conventional buildings in relation to ecologically more efficient habitats is presented. The concepts of sky mining and enlightened building design strategies are suggested. (MCW)

25743 **Light distribution in three earth-embanked houses.** Simmons, J.D. (Science and Education Administration, Clemson, SC); Newman, J.O.; Godbey, L.C.; Davis, M.A. pp VI.11-VI.17 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Tests were conducted to determine the distribution and amount of natural light throughout three semiunderground prototype houses. Each house is earth-embanked on three sides and has a south-facing exposed wall. The homes were built in succession, with an increased design emphasis on available natural light. Results of the test revealed that the first house, designed for maximum energy conservation, did not meet standards set for natural light. The second house was in partial compliance with the standards, and the third house met or exceeded the standards in all rooms of the structure. The amount and distribution of available natural light as a result of various design solutions used in earth-embanked housing is discussed.

25744 **Implications for habitability design and energy savings in earth sheltered housing.** Weber, M.J.; Boyer, L.L.; Grondzik, W.T. (Oklahoma State Univ., Stillwater). pp VI.21-VI.27 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

Earth sheltered habitats in Oklahoma were studied through a detailed questionnaire process and indepth interviews. Preliminary results of the decision process, habitability, and energy aspects are presented. Saving energy was reported to be the major incentive for building such structures. Habitability aspects have generally not received much study. Of major interest is the finding that the energy savings that are realized have been achieved with little decrease, and often an increase, in comfort and habitability aspects. Most occupants expressed a high level of satisfaction with the safety of the structure and the arrangement of the rooms, which in most cases were custom designed by or for the occupants. However, daylighting and privacy of family members were not as highly rated. A number of other parameters are identified from the survey which present implications for design enhancement in earth sheltered structures.

25745 **Earth covered barrel shell structures.** Langley, J.B. pp VII.5-VII.15 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

The economic and functional advantages and challenges of the concrete barrel shell structure in earch sheltered design are detailed. All features of shell construction are discussed with special emphasis on residential buildings. Materials, planning, and construction techniques are discussed for shells 20, 24, and 28 feet wide. The specifics of a 24-foot shell house (Ward House) constructed in Central Florida are detailed. The passive space HVAC system and solar water heating systems are described. The use of a windmill water pump is investigated and suggestions are made for use of a windmill pump . Economics of the structures are discussed and some estimates presented. (MCW)

25746 **Thin shell roof systems and construction techniques for earth sheltered housing.** Behr, R.; Kiesling, E.W.; Boubel, G. (Texas Tech Univ., Lubbock). pp VII.19-VII.27 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

The economic benefits and concept marketability of various thin shell design strategies are exploed, including domes, arches, free-form, and sandwich panels. A discussion on pouring concrete into a mold of the structural shell which is carbed into the soil if site and soil conditions permit is presented. Information on the use of timbers and wood to construct a dome and then leaving them in place for the inside of the structure for the dome covered with a thin layer of concrete for the roof is also discussed. Construction details for a house (Ashford) in Muleshoe, Texas, using the soil for trenching technique with the house and garage completely soil-covered are discussed. (MCW)

25747 **Earth, energy, architecture and steel culvert construction.** Cook, G.R.; Allan, G.E. (Criteria, Inc., Saint Paul, MN). pp VII.39-VII.44 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

The innovative, environmentally responsible design for an office-residence complex (Terratech Center) is presented in detail. Features of the two pre-engineered steel vaults, placed in parallel and connected by an atrium, that form the complex in the Twin Cities area are described. The total building area is 12,884 ft². The building houses Control Data/TerraTech Divisions, Criteria... Inc., and an apartment for Criteria's president and his family. The philosophy of the design is discussed. The garden environment and the passive design are detailed. Other projects with related design emphasis are shown. (MCW)

25748 **Earth sheltered concrete domes using a geodesic formwork.** Andre, J. (Ozark Domes, Inc., Fayetteville, AR); Pleimann, L.G.;. pp VII.47-VII.50 of Proceedings: earth sheltered building design innovations. Boyer, L.L. (ed.). Stillwater, OK; Oklahoma State University (1980).

From National technical conference - earth sheltered building design innovations; Oklahoma City, OK, USA (18 Apr 1980).

An earth sheltered residence being constructed in northwest Arkansas is described. The basic structure is a thin concrete dome sprayed on a triangular panel geodesic dome formwork. The plywood skinned geodesic dome kit is constructed in a manner to be easily removable for reuse. The concrete dome, after proper curing, is covered by a sprayed layer of polyurethane insulation. Daylighting and ventilation are provided by a central skylight which is operable for differing ventilation rates and as a secondary means of egress. Additional winter solar heating is provided by a southerly exposed greenhouse attached by separate entrance to the southwest of the dome.

25749 **Does the insulation have a thermal conductivity. The revised ASTM test standards require an answer.** Pelanne, C.M. (Johns-Manville Research and Development Center, Denver, CO). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 60-70(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

An improved understanding of the heat flow processes in thermal insulations has mandated a conceptual revision of the basic ASTM test methods applicable to heat transmission through thermal insulations. The test methods as previously written allowed almost exclusively the measurement of thermal conductivity, a property which thermal insulations, for the most part, do not have. The factors which have prompted the change are discussed.

25750 **Natural convective heat transfer in permeable insulation.** Bankvall, C.G. (Swedish National Testing Institute, Boras). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 73-81(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The natural convective heat transfer in permeable insulation is described. Equations and results are given to calculate the influence from natural convection upon the heat transfer in insulated structures. It is assumed that there is no influence from forced convection and that the whole space is filled with insulation.

25751 **Heat transfer versus pitch angle for nonventilated, triangular-sectioned, apex-upward air-filled space.** Thirst, T.J.; Probert, S.D. (Cranfield Inst. of Technology, Bedford, England). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 203-210(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The optimal pitch angle of a nonventilated triangular-sectioned air space, corresponding to a minimum heat transfer (Q) versus pitch angle (θ), was experimentally determined on a laboratory model to be 18° inclination for small values of temperature difference (ΔT) appropriate to those that would occur in roof spaces. In a more realistic roof cavity, this optimal pitch would be smaller; it is suggested that full-size nonventilated roofs be designed with pitches near 15°.

25752 **Influence of moisture and moisture gradients on heat transfer through porous building materials.** Bomberg, M.; Shirtliffe, C.J. (National Research Council of Canada, Ottawa, Ontario). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 211-233(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The total heat transfer through moist, porous building materials is the sum of a number of heat-transfer phenomena. Experimental data on heat transfer through specimens of moist aerated concrete and mineral fiberboard are presented. The aerated concrete specimens with known initial moisture distributions were exposed to a temperature gradient. This temperature gradient caused a redistribution of moisture which in turn changed the heat flow through the material. The changes were monitored by means of thermal probes, heat flowmeters, and thermocouples. The results of measurements were compared with calculations based on a simplified analytical model and with measurements made by other investigators. A second series of tests was made on a moist specimen of high-density mineral fiberboard to demonstrate the extent of the dependence of the total thermal resistance on the distribution of moisture in the material.

25753 **Calibrated/guarded hot-box test facility.** Miller, R.G. (Jim Walter Research Corp., St. Petersburg, FL); Perrine, E.L.; Linehan, P.W. *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 329-341(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

A hot-box test facility, in which the equipment is capable of operating in either a calibrated or a guarded mode, is described. The basic design consists of a separate cold box, hot box, specimen frames, refrigeration unit, control and data-acquisition panel, and metered box. Both the hot and cold boxes are insulated with low-density polyurethane foam, with an overall minimum thickness of 30.5 cm (12 in). The attitude of the test facility can be varied to provide upward, downward, or horizontal heat flow. Both the hot and cold boxes can provide variable air velocities parallel to the specimen face. The following is a summary of the operating characteristics of the test facility: test specimen area dimensions: 2.4 by 2.4 m (8 by 8 ft); guarded mode metering area: 1.8 by 1.8 m (6 by 6 ft); cold side: normal temperature range: 27 to -23°C (80 to -10°F), special temperature range, to -46°C (to -50°F), air velocity: 0.8 to 24 km/h (0.5 to 15 mph); hot side: temperature range: 2 to 71°C (35 to 160°F) and air velocity: 0.8 to 24 km/h (0.5 to 15 mph).

3202 Transportation

REFER ALSO TO CITATION(S) 25766, 25783

25754 (DOE/CS/58840—T1) Impact of fuel-economy information on new-car and light-truck buyers. McNutt, B.; Rucker, E. (Energy and Environmental Analysis, Inc., Arlington, VA (USA); USDOE Office of Policy, Planning and Analysis, Washington, DC. Office of Conservation; USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC. Office of Transportation Programs; Power (J.D.) and Associates, Inc., Los Angeles, CA (USA)). May 1981. Contract AC01-77CS58840. 107p. NTIS, PC A06/MF A01. Order Number DE81024297.

The US Environmental Protection Agnecy (EPA) established an automobile fuel economy information program shortly after the oil embargo, effective for the 1974 model year. The US Department of Energy (formerly the Federal Energy Administration) joined EPA soon afterward in sponsoring the information program. The program is aimed at furnishing consumers with information on estimated miles per gallon of new cars and light duty trucks. The mechanisms of distributing such information include mandatory display of fuel economy ratings on new vehicles, and copies of a printed Gas Mileage Guide for New Car Buyers required to be made available in car dealer showrooms. The program has gone through a number of changes over the years. Consumer interest in fuel economy has also increased in the past few years. Along with this increasing interest has come increased criticism of the EPA/DOE information program. In response to this criticism and in view of the many changes in the program the DOE initiated a comprehensive evaluation of the information program. The evaluation was aimed at obtaining an accurate understanding of the public's perception of the existing program and developing other information needed to make improvements in the program. Both quantitative and qualitative methods were used to assess program awareness and impact. The results of this evaluation, along with major findings and recommendations are presented.

25755 (PB—81-114753) The effect of economic regulation on fuel-use efficiency in private trucking operations. Final report. (Policy and Management Associates, Inc., Boston, MA (USA)). Apr 1980. Contract DOT-OS-90023. 105p. NTIS, PC A06/MF A01.

Private trucking operations are a substantial component of the motor carrier industry. The description of private carriage covers: magnitude and growth, reasons for use, traffic characteristics, fleet operations, relations with other modes, and the effect of the regulatory system on private trucking operations. In addition, there is an analysis of how ICC regulations affect private trucking's fuel-use efficiency and an attempt to forecast the effects of regulatory change.

25756 (UMTA-NC—06-0002-80-1) User-side subsidies for shared-ride taxis in Kinston, North Carolina. Final report. (Charles River Associates, Inc., Boston, MA (USA)). Oct 1980. 221p. NTIS.

The Kinston User-Side Subsidy Demonstration began operation in September, 1977. This was one of four simultaneous demonstrations of the user-side subsidy concepts conducted under the UMTA Service and Methods Demonstration Program, and involved the provision of reduced-fare conventional taxi service to the elderly and handicapped with the primary objective of increasing their mobility. Eligible individuals who registered with the subsidy program were able to purchase tickets for regular taxi rides within Kinston for one-half of their face value (i.e., a 50% subsidy). After tickets were used by registrants to pay for rides, taxi operators redeemed them for full face value. This report summarizes the findings of the independent evaluation of the Kinston project. In Kinston, user-side subsidies were found to be administratively feasible and were utilized almost exclusively by the most mobility-disadvantaged segments of the eligible population. These individuals, who typically had low incomes and/or few travel alternatives, used the project to increase their frequency of total tripmaking by 3 to 4%, and to make some trips by taxi that otherwise would have been made by a less-preferred mode (e.g., walking). The resulting changes in taxi-use frequency caused some changes in the supply of taxi service, though these were concentrated among firms that carried a large proportion of elderly and handicapped riders prior to the demonstration. Overall, the Kinston project provides evidence that user-side subsidies can be a viable and practical technique for facilitating the mobility of the elderly and handicapped.

25757 (Y—2244) Bus annunciator system. Carver, D.W.; Duncan, M.G. (Oak Ridge Y-12 Plant, TN (USA)). 9 Jun 1981. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01. Order Number DE81024942.

As a means of saving energy while minimizing the need for passenger cars, vans, and trucks in the Oak Ridge Y-12 Plant, buses are provided which operate along approximately 6 miles of in-plant roads. A bus annunciator system was developed, fabricated, and installed which reduces the waiting time to near zero. The system consists of three separate devices: (1) an ultrasonic transmitter attached to the side of the bus, (2) a solar-powered ultrasonic receiver and radio-frequency transmitter at roadside, and (3) a receiver-annuciator interfaced with building public address systems. The prototype has been tested in only two areas of the Y-12 Plant, but a coded transmitter and receiver make it possible to cover the entire plant. In full operation, approximately 12 roadside units would be employed to give an average of about 2 to 3 min advance notice to personnel in buildings and offices along the two bus routes inside the Y-12 Plant.

25758 Overview of aviation energy programs and supply problems. Bowles, R.; Cignatta, J.V. (US DOE). *SAE (Society of Automotive Engineers) Preprint ;* No. 801230, 12(Oct 1980).

For aviation to remain an efficient, cost-effective means of transportation, a comprehensive and systematic program to alleviate the industry's petroleum dependency is necessary. This paper describes research being conducted to (1) assess problem areas affecting production of current jet aviation fuels, (2) evaluate energy conservation measures, and (3) develop alternative fuels. 16 refs.

25759 Interlaboratory comparison of the ASTM C 335 pipe insulation test. Hollingsworth, M. Jr. (Owens-Corning Fiberglass Corp., Granville, OH). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 50-59(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

An interlaboratory round-robin test program was conducted for comparison of results from the ASTM Test for Thermal Conductivity of Pipe Insulation (C 335-69). Two specimens of glass fiber pipe insulation have been tested over a range of mean temperatures of approximately 50 to 150°C (120 to 300°F). Data from the nine laboratories reporting tests on one specimen show good agreement with an overall expected error of +- 4.2 percent. During the 7 1/2-year test period, the specimen shows some degradation due to handling as is evident from a loss in weight and from a trend toward a slightly high conductivity in repeat tests conducted by two laboratories. If this specimen change is considered, it is evident that the test error is approximately +- 3 percent. Tests on the second specimen have been limited to fewer laboratories, but similar results are evident. The general conclusion is that good agreement is obtained for the temperature range investigated. It would be desirable, however, to have a standard specimen which could be used up to the temperature limit of the apparatus and which could stand the repeated handling and temperature exposures without change.

25760 Heat transfer in refractory fiber insulations. Striepens, A.H. (Rockwell International, Downey, CA). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 293-309(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

Test results are presented for the thermal conductivity, over a broad range of temperatures and pressures, of two refractory blown fiber insulations. The data, which were obtained for several bulk densities of each material, are compared with predictions from a theoretical expression that accounts for radiation transmission as

well as solid and gas conduction contributions to the effective conductivity. The simple model utilized provides a remarkably accurate prediction of insulation performance for the materials of interest and, therefore, represents a useful tool for design purposes, minimizing the amount of actual testing necessary to characterize candidate materials. Criteria are indicated by which it is possible to determine whether the model will be applicable to a given fiber insulation.

25761 **New high-temperature guarded hot-box facility for reflective insulation.** Wahle, H.W. (Babcock and Wilcox Co., Alliance, OH); Rausch, D.A.; Allmon, B.A. *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 342-356(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

The problems associated with testing reflective insulation panels (currently being used to insulate commercial nuclear power plants and industrial piping) are presented and a modified high-temperature guarded hot box designed for this purpose is described. Test results are presented that verify the new facility for use with both homogeneous materials and nonhomogeneous reflective insulation panels. A large-scale experiment is described that can be used to measure panel heat loss in a real system environment.

25762 **Calibrated hot-box approach for steady-state heat-transfer measurements in air duct systems.** Lauvray, T.L. (Owens/Corning Fiberglass Corp., Granville, OH). *American Society for Testing and Materials, Special Technical Publication ;* No. 660, 357-373(1978). (ASTM-STP—660; CONF-770936—).

From ASTM symposium on heat transmission measurements; Philadelphia, PA, USA (19 Sep 1977).

A procedure for measurement of steady-state heat transfer through the walls of air duct systems under actual operating conditions and configuration is described. The procedure uses two independent measurement techniques. A calibrated hot box is the primary measurement technique and an airstream temperature-drop measurement provides a secondary technique. The calibrated hot box is a heavily insulated box which is sealed around a duct conveying cold air. A temperature controller and electric resistance heaters maintain the box temperature as close as possible to ambient temperature. Thus, the laboratory space acts as a guard for the box. The energy input to the box is measured with a wall-hour meter. The total energy input, corrected for the heat transfer through the box wall, represents the heat transfer through the test system. The temperature-drop technique uses thermocouples to measure the temperature difference between two stations in the test duct and orifice plates to measure airflow. The heat transfer from this technique is compared with calibrated hot-box measurements. An automatic data collection system is used so that tests can be conducted over a long period of time to assure steady-state conditions and to determine reproducibility. Verification of the calibrated hot-box technique is achieved by testing a specially constructed section of duct whose heat transfer can be readily calculated. Experimental and calculated data are presented for this duct system.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 24927, 24928, 24929, 24932, 25043, 25044, 25075, 25182, 25183, 25198, 25275, 25348, 25358, 25361, 25439, 25454, 25617, 25618, 25619, 25620, 25623, 25672, 25714, 25715, 25761, 25832, 25835, 25839, 25861, 26024

25763 **(CONF-800272—) Proceedings of second Franco-American conference on industrial energy conservation.** Poirier, J.L. (Hagler, Bailly and Co., Washington, DC (USA)). May 1981. Contract AC01-79CS20095. 315p. NTIS, PC A14/MF A01. Order Number DE81023976.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

A separate abstracts was prepared for each of the 20 papers presented at the conference. All of the abstracts will appear in Energy Research Abstracts (ERA); 5 were selected for Energy Abstracts for Policy Analysis (EAPA). (MCW)

25764 (CONF-800272—, pp 1-5) **Role of the industrial energy conservation in the US energy program.** Harvey, D.G. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

The first objective of the program is to improve the energy efficiency of the industrial processes. But because there are extensive coal reserves in the US and renewable resources reserves such as wood and biomass, a second objective is to replace oil and gas with biomass and coal as cost-effectively as possible. The third objective is to make optimum use of the materials used in the processes. The goal is the same through the achievement of these objectives and in cooperation with industry, 1 quad by 1985 and 5 quads by 2000. Approaches to the problem of improving energy efficiency are discussed, and programs in various industries are described briefly. (MCW)

25765 (CONF-800272—, pp 17-24) **Industrial thermal-storage applications.** Duscha, R.A. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

Four studies of industries with the potential for significant energy savings through the use of TES systems are described and analyzed. These industries were paper and pulp, food processing, steel and iron, and cement. An analytical survey was conducted for each industry to determine the potential total recoverable energy. Candidate storage systems and applications for using the recovered energy were evaluated. Preliminary conceptual designs were evolved for which performance analyses were conducted. Economic analyses were made for the most-promising designs, and the potential technical feasibility and economic benefits were assessed and summarized. Any development required was identified, and each study was concluded with a commercialization plan being formulated. Results of these studies indicated that, within these industries, thermal energy storage of process and reject heat for subsequent in-plant use appears to be economically and technically feasible with significant near-term conservation benefits. Potential annual fuel savings with large-scale implementation of near-term TES systems for these industries is over 9×10^6 bbl of oil. This savings is due to recuperation and storage in the food-processing industry, direct fuel substitution in the paper and pulp industry, and reduction in electric-utility-peak fuel use through in-plant production of electricity from utilization of reject heat in the steel and cement industries. (MCW)

25766 (CONF-800272—, pp 25-43) **High-temperature phase change thermal storage.** Alleau, T.; Bricard, A. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

Research on latent heat storage is described. Thermal energy storage offers substitution or savings of fuels as well as reduction in capital expenditures. Investigations on heat storage with sodium hydroxide at 320°C to define the characteristics of a heat accumulator coupled to the power network during off-peak hours and capable of producing 100 kg of steam at a pressure of 10 bars are discussed. Heat-storage research using LiF-LiOH at 450°C aimed at designing and constructing a heat storage-system to equip submarines and intended to provide heating for two divers over 6 hours is described. Heat storage research using LiF-MgF_2 at 745°C with the objective to design and construct a heat source and its thermal coupling to a Stirling motor to propel a submarine for about 10 hours is described. The economics of these considerations are noted. (MCW)

25767 (CONF-800272—, pp 44-62) **Industry/DOE diesel cogeneration demonstration program.** Davis, J.P. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

This diesel cogeneration program has the primary objective of providing near-term, highly visible, and original hardware demonstrations to increase industry's interest in cogeneration systems and to expedite technology transfer. The chemical industry is currently a major user of cogenerated power. The cogeneration system demonstration for the chemical industry is based on the use of slow-speed, two-stroke diesel engine. Engines of this type are not

currently in use in this country. The proposed effort will provide an industrial demonstration of such a system under typical US operating conditions, and will clearly establish the capabilities and applicability of diesel cogeneration systems for achieving economic energy savings. The diesel engine cogeneration system demonstration will be located at the Hoffmann-La Roche plant in Belvidere, NJ. The cogeneration system includes the following: slow-speed, two-stroke diesel engine rated at 28,000 kW; supplementary-fired recovery boiler on the diesel-engine exhaust providing 200-psig process steam to the plant; and heat exchanger recovering engine reject heat from the jacket, pistons, lube oil, and turbocharger and providing 180°F hot water to the plant. The preliminary system design, the plant description, performance monitoring, utility interactions, economics and environmental assessments are discussed.

25768 (CONF-800272—, pp 63-94) **Technical-economical aspects of mechanical energy production from waste heat by using organic fluids working on Rankine cycles.** Dahan, G.; Verneau, A. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

Production of mechanical energy from waste heat can be achieved with organic fluids working on Rankine cycles which recover low- and medium-temperatures heat in industrial effluents. Recovery cycles are identified. Industrial applications described are energy recovery from hot liquids, condensable vapors, and hot gases. Cost estimates are made. Experiences with development of a 100-1000 kWe range solar power plant at Bertin and Cie are described. The company then started developing medium-concentration collectors to heat a carrier fluid up to 270°C (520°F); this temperature is suitable for both a good conversion efficiency and heat storage by means of existing and inexpensive fluids. At this temperature level it was logical to associate the collectors with an organic-fluid Rankine-cycle system.

25769 (CONF-800272—, pp 95-107) **Ceramic heat-recovery systems for high-temperature furnaces.** Young, S.B. (Hague International, South Portland, ME). May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

The use of a ceramic recuperator to recover heat in hot exhaust gases from a forge furnace is described. Using a ceramic rather than a metallic recuperator obviates the need for dilution of process gases entering the recuperator. Advantage of eliminating dilution are discussed. Specifically, the CERHX ceramic heat exchanger at Hague International is described. The installation history, economics, and payback are discussed.

25770 (CONF-800272—, pp 108-118) **Oxygen-converter gas recovery.** Troller; Vervacke. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

A system to collect energy from exhaust gases in a steelmaking plant is described. The energy savings, recovery techniques, and uses of the oxygen-converter gas are discussed. The gas emerging from the IRSID/CREUSOT-LOIRE non-combustion gas-collection process has a high carbon monoxide content and a calorific value of 225 to 250 Btu/ft^3, approxiately. It may be used as fuel alone or mixed with other gases.

25771 (CONF-800272—, pp 119-142) **Wet processing of textiles using foams.** Gregorian, R.S. (United Merchants and Manufacturers, Langley, SC). May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

The wet processing of textiles including designing, bleaching, dyeing, and/or printing and finishing is discussed. The use of foams for the processing is described. In-place wet-processing lines can be easily retrofitted for foam processing with minimal capital expenditure. It is concluded that foam processing will significantly reduce energy consumption by the textile industry while simultaneously improving productivity, reducing water consumption, and still provide fabrics whose physical and aesthetic properties are excellent.

25772 (CONF-800272—, pp 143-169) **Energy savings in milk production: mechanical vapour-recompression concentration (comparison to classical technology).** Ciboit, J. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

Performance of the mechanical vapor-recompression plant (ORLAC plant) at St. Etienne to concentrate milk products is discussed. Resullts are compared with a conventional multi-stage type. Specifically discussed are: steam-thermocompression systems; direct-type heat-recovery pump systems; and indirect-type heat-recovery pump systems. An analysis of energy balance and operation costs for the demonstration ORLAC plant is made. Comparisons are made of multi-stage evaporators and mechanical vapor-recompression systems.

25773 (CONF-800272—, pp 170-175) **Conversion of atactic polypropylene waste to fuel oil.** Staffin, K. (Procedyne Corp., New Brunswick, NJ). May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

Procedyne Corp. has developed a pyrolysis process that converts the approximate annual generation of 400 million pounds of waste atactic polypropylene to useful fuel oils in yields of approximately 90% of available fuel value. The remaining 10% is gaseous fuel, which is adequate to supply the energy requirements of the pyrolysis process. All fuel products of the process can be burned in standard commercial-burner equipment. The process has been operated on a semi-works scale at Procedyne facilities in New Brunswick, NJ. The operating capacity of the plant is approximately 500 pounds per hour. The pilot-plant operation was successful, and the first commercial plant is being constructed at LaPorte, Texas. This plant has a design capacity of 17,000,000 pounds of waste atactic feed per year. The process and budgetary and economic considerations are described.

25774 (CONF-800272—, pp 176-184) **Energy recovery from industrial and vegetable wastes.** Pillard. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

Progress in energy-recovery developments from the combustion of industrial and agricultural wastes is reviewed. For industrial wastes, combustion in boilers, combustion in horizontal or vertical furnaces followed by recovery boilers or exchangers, and problems for the manufacturers and the user are subjects briefly discussed. Direct combustion and gasification of agricultural wastes are discussed.

25775 (CONF-800272—, pp 185-197) **Ceramic recuperators for industrial flue-gas energy recovery.** Cleveland, J.J.; Kohnken, K.H. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

Recuperation of high-temperature flue gas is discussed. Fuel savings that can result by recuperation of flue gas and preheating the combustion air are illustrated. The use of ceramic recuperators which allow recuperation of flue gases at higher temperatures (the safe limit for metallic recuperator systems is about 1600°F) have proven effective and save energy.

25776 (CONF-800272—, pp 198-204) **Direct heat exchanger: Saturne recuperator.** Meunier. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

A new type of direct-contact, countercurrent gas/pulverized-solid heat exchanger is described. The objective of the project is to apply the exchanger to the fabrication of glass, in the preheating of sand to 600°C, 800°C, and finally to 1150 to 1200°C. A theoretical study of the hydrodynamics and heat-transfer properties of the system was conducted. A license has been issued to develop and exploit the process for all non-glass production-related applications. Applications studied are: a simple preheater; a preheater associated with a direct fuel-combustion fluidized bed; and utilization of

two exchangers (one preheater and one cooler associated with a fluidized bed). Applications envisioned and applications to the treatment of bituminous sands are noted.

25777 (CONF-800272—, pp 205-215) **Forced-circulation steam generators designed and developed for energy recovery in industry.** Tillequin. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

Heat exchangers which vaporize the thermodynamic fluid from the recovered heat being developed by CREUSOT-LOIRE are discussed. They are generally adapted to the generation of steam in sealed circuits (containing an organic fluid or ammonia) or in closed circuits requiring only a small amount of make-up water (return of clean condensed steam as may be found for example in the chemical industry). Accepting that steam generators can be considered to be made up of two half-exchangers connected by a metal wall, the waste-heat recovery function and the evaporation function for water, organic fluid, or ammonia can be separated. The functions are discussed for the once-through steam generator developed by CREUSOT-LOIRE. The economics of the systems is discussed briefly.

25778 (CONF-800272—, pp 216-240) **Industrial heat pumps and their applications.** Moreland, W. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

The functioning and operation of heat pumps are discussed generally, but the coefficient of performance is stressed. Information is discussed on how to estimate whether a particular heat-pump application has sufficient merit to be considered as a potential candidate. Applications of heat pumps manufactured by Westinghouse with a capacity of 200 thousand Btu's to one million Btu's per hour and with a temperature output from 50 to 230°F are reviewed. The development and demonstration program at Westinghouse for higher-temperature heat pumps are described, and the major objectives are delineated. The criteria for selecting the design and working fluid are described. An example is cited for a potential application, and calculations are shown for the estimated payback of the DOE High-Temperature Heat Pump with a delivery temperature between 250 and 350°F. (MCW)

25779 (CONF-800272—, pp 241-254) **Development of original water/steam heat pump for industrial applcations.** Marchal, P. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

Generalities about heat pumps are discussed. With the need for higher temperatures for most industrial-process applications, the need arose for new development in heat pumps. Using steam as a fluid presented the problem of superheating and the solution of developing a water/steam heat pump using water ring compressors was advanced. The principle, a description of the water ring compressor, and some testing results are discussed. Specific applications for the steam heat pump using water ring compression discussed are for a thermomechanical wood-pulp process and for industrial drying; schematics of the systems are presented. (MCW)

25780 (CONF-800272—, pp 255-275) **Market outlook for energy-saving technologies in the US industrial sector.** Bailly, H.C.; Poirier, J.L. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

The market outlook for energy-saving technologies in the US industrial sector over the next 5 years is analyzed. The market analysis is discussed in four areas, namely: energy-transforming technologies (conversion of fuel to steam heat, electricity, and mechanical power); energy-recovery technologies; energy-control technologies; and process retrofits. To achieve its goal of 2.4 trillion Btu in 1985, it is projected that US industry will invest from 4.2 billion dollars (19.3 billion francs) in energy-saving technologies in 1981 to 10.2 billion dollars (43 billion francs) in 1985. These investments will grow at an annual rate of 19% and represent 3 to 5% of total investments by US industry. The growth in sales of energy-saving technologies is expected to boost the overall market for energy systems; in a period of slow economic growth such as we project for 1981 to 1985, the market for industrial energy systems ordinarily would not increase at a rate higher than 3%.

25781 (CONF-800272—, pp 276-287) **Impact of government incentives on the market for energy-saving technologies in the US industrial sector.** Reid, R.O. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

The economic and political aspects of government incentives for stimulating industrial energy-saving technologies are discussed. The question of the need for incentives is a difficult one. Clearly the US prides itself on allowing the free-market system to function. At times, however, the government intervenes to provide signals as to the proper direction. The necessity of government intervention is questioned. The need for incentives and industrial aspects are discussed. Some ground rules for considering economic incentives are established: reduce our dependency on imported oil; establish the criterion that the most cost effective means be adopted to achieve this objective; and attempt to provide maximum stimulus per dollar of expenditure. Incentives measures discussed are: the Energy Act of 1978; a bill introduced in 1979 calling for a $15 rebate for each barrel of oil-equivalent reduction in oil and gas used in industry; and a billing introduced calling for reducing gas and oil consumption through either fuel switching or improved efficiency. These are analyzed to see if they meet the established ground rules. (MCW)

25782 (CONF-800272—, pp 288-299) **Analysis of French investments in energy conservation technologies since 1974 and economic actions undertaken by the French government.** Jachimiak. May 1981. NTIS, PC A14/MF A01.

From 2. Franco-American conference on industrial energy conservation; Washington, DC, USA (13 Feb 1980).

The performance of the French industry is summarized in terms of energy savings realized between 1973 and 1978. It is estimated that the cumulative energy savings between 1973 and 1978 are in the order of 3.5 million tons oil equivalent (MTOE) (or 140 trillion Btu), which implies that by 1985 savings of 7 to 8 MTOE (or 300 trillion Btu) could be realized compared to 1973 level. These energy savings result essentially from housekeeping actions with early impacts and from energy efficiency-improvement investments. The energy savings associated with the latter in the 1973 to 1978 period are estimated to be 500,000 MTOE (or 20 trillion Btu). Actions undertaken by the French Conservation Agency in some specific industries are discussed, and generic technologies applicable in all sectors of the industry are pointed out. Results are described. (MCW)

25783 (CONF-7910214—, pp vp, 57p) **Energy conservation applications of microprocessors.** Shih, J.Y. (National Bureau of Standards, Washington, DC). 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

A survey of the application of microprocessors for industrial and commercial energy conservation has been made. Microprocessor applications for HVAC, chiller control, and automotive equipment are discussed. A case study of successful replacement of a conventional cooling plant control is recounted. The rapid advancement of microelectronic technology will affect efficient energy control, more sophisticated control methodology, and more investment in controls.

25784 (CONF-7910214—, pp vp, 11p) **Designing for the future: engineering plant.** Warner, P.C. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Designing for the future is discussed with a view to the scarcity of primary energy resources and rising prices, specifically from the point of view of the supplier of mechanical and electrical plant for the industrial, commercial, and occasionally even the domestic market. Illustrations are presented using companies from the engineering industry. Savings in production, energy availability and the

consumer, efficiency improvements, and changes in plant concept are discussed. (MCW)

25785 (CONF-7910214—, pp vp, 22p) **Waste as a fuel.** Lowes, T.M.; Lorimer, A.D. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

The methods of using the energy available in wastes to reduce the energy costs in processes are discussed. Special reference is made to the need for careful evaluation of the potential of the waste to reduce energy costs, before significant investment is made. Problems generally arise due to the effective balancing of the cost of the waste pretreatment with the disposal fee and prime fuel saving. Special reference is made to use of waste as a fuel in the cement industry. Municipal refuse is discussed as a typical successful application.

25786 (CONF-7910214—, pp vp, 24p) **Energy sense is common sense.** Manuel, K. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Background information about the West Midlands Region of British Gas is presented and this sets the scene for the subsequent description of the action taken to conserve energy in all West Midlands Gas operational activities. The basic organizational structure for dealing with energy throughout the Region is outlined. The objectives of the Energy Conservation Working Party are defined and the achievements in energy saving since April 1975 are highlighted. The monitoring and control action taken to save energy in buildings and functional engineering and transport activities is described and reference is made to special projects undertaken to improve performance in energy utilization. Special emphasis is given to the promotion of energy conservation through the use of specially designed posters and stickers, by publicity in the in-house newspaper Boost, and by annual Energy Conservation Conferences and Awards for the Conservation of Energy in the form of an ACE Trophy for group achievement and ACE Merit Awards for individual achievement. The motivational aspects of the Region's energy conservation campaign are discussed and plans for continuing to gain the cooperation of employees to conserve energy are outlined. It is concluded that the success achieved by the Region in saving energy has been significantly influenced by the special attention which has been given to mounting an imaginative, intensive, and long term campaign aimed at involving all employees and to gaining their continuing commitment to energy conservation.

25787 (CONF-7910214—, pp vp, 6p) **Conserving energy by eliminating waste.** Jones, N.H. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Some ways in which energy is wasted in industry are discussed and the losses involved are quantified. Reference is made to a particular loss in annealing furnaces; wasted energy in factory and lighting systems; heat generated by motors and lighting and by such processes as welding; unlagged hot pipework and most hot processes; and poor building envelope features. It is concluded that an industry should declare its intention of conservation at the highest possible level, identify conservation as a manufacturing target, and invest the responsibility in people for whom it is a full-time activity. (MCW)

25788 (CONF-7910214—, pp vp, 14p) **Canada's voluntary industrial energy conservation programme.** Wolf, C.A. Jr. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

The organization of the voluntary industrial energy conservation program is described. There are 15 industrial sectors in the program and the plan implemented by the sectors including individual companies, trade associations, industry task forces, task force coordinating committee, and government is described. Targets for attack are mainly housekeeping projects, energy efficiency in retrofitting, and new processes. Problems are identified. It is concluded that compiled total performance has essentially achieved its target of 12% improved energy efficiency two years ahead of schedule. (MCW)

25789 (CONF-7910214—, pp vp, 26p) **French industry and the energy conservation challenge.** Serpette, M. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

The general position of France and its energy conservation objectives; the action taken by the government to stimulate this policy; and government cooperation with industrial circles and the action of industry itself are discussed. It is observed that the potential for future energy savings are smaller in France than in other countries because consumptions are already down to minimal levels. Consumption patterns in France are illustrated. (MCW)

25790 (CONF-7910214—, pp vp, 137p) **Energy conservation at the Nippon Steel Corporation.** Ishihara, S. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Characteristics of the Japanese energy demand-supply structure are discussed. Nippon Steel's energy consumption and energy conservation measures are discussed. Results of Nippon's energy conservation activities are summarized. Additional information on the Japanese short-range measures for the reduction in oil consumption, the effect of efforts for the reduction of petroleum consumption, and concrete measures for securing the effect is included.

25791 (CONF-7910214—, pp vp, 12p) **Good housekeeping at Vauxhall Motors Limited Luton.** Gormley, D. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Organization and standards of the energy conservation and management programs at Vauxhall are discussed. Implementing the program followed identification of wastage areas which are listed. Technical solutions and innovations to improve efficiency of equipment and methods of control are described. Uses of audits and metering are indicated. (MCW)

25792 (CONF-7910214—, pp vp, 10p) **Energy conservation campaign at Sandvik A.B. in Sandviken.** Larsson, R. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

The energy conservation campaign at Sandvik AB in Sandviken, consisting of the Parent Company Sandvik AB and 100 subsidiary companies in 37 countries, is described. The company sectors are: cemented carbide; steel, saws and tools, and conveyors. Energy used in 1978 for various processes and in building space is tabulated. The campaign, to use energy at the 1974 level, involves the following: define the goal; establish a distinct responsibility; chart earlier consumption; inform and motivate the staff; start with existing resources and simple measures; systematize the saving of energy; make an investment plan; and follow-up the result regularly. (MCW)

25793 (CONF-7910214—, pp vp, 14p) **Energy auditing in connection with subsidy schemes for energy saving investments.** Broend, E. (Danish Boiler Owners' Association, Copenhagen, Denmark). 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

A review of the energy situation in Denmark is presented. Government subsidies for investments aiding projects aimed at reducing process energy consumption are discussed. The law serves as an incentive for the implementation of energy saving measures which would not otherwise be carried out because they would not be sufficiently economic. Subsidies of up to 40% of the amount invested are available. The special form of energy auditing carried out on the part of society concerning industrial energy consumption and some idea of how energy auditing is practiced in the individual enterprise are discussed.

25794 (CONF-7910214—, pp vp, 30p) **Energy conservation in French industry and at Rhone-Poulenc.** Mongon, A. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Thirteen examples are given to illustrate France's energy conservation program. The examples show the most efficient way of energy sources management, the application of the process optimization's method, and the use of control equipment for process and heating. The details on how energy is used rationally at Rhone-Poulenc are presented.

25795 (DOE/BETC/IC—80/3(Vol.4), pp 11p, Paper 30) **Distillate shale oil/diesel engine operating compatibility.** Nelson, L.P. (Energy and Environmental Research Corp., Santa Ana, CA); Folsom, B.A.; Heap, M.P.; Lavy, M.W. 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 1980.

Tests and being conducted to define the technical limitations involved in operating stationary diesel engines with a distillate shale fuel and shale/petroleum fuel blends. They are the focus of a program which is designed to identify any operating problems that may be encountered when non-petroleum based fuels are brought into widespread service in stationary diesel engines. The tests employ a medium speed (900 rpm), medium power (710 bhp) engine that is representative of a substantial portion of the projected diesel engine population for the years 1980 to 2000. While the program will recommend solutions to the problems identified, development effort to solve these problems is beyond the scope of this study.

25796 **(DOE/CS/40215—T1) Energy savings through the use of an improved aluminum reduction-cell cathode. Technical progress report, April 1, 1980-June 30, 1980.** Dorward, R.C.; Payne, J.R. (Kaiser Aluminium and Chemical Corp., Pleasanton, CA (USA)). 5 Aug 1980. Contract AC03-76CS40215. 9p. NTIS, PC A02/MF A01.

Goal is to develop a Hall cell cathode, which will reduce the specific energy consumption of existing commercial cells by 20 to 25%. Basis of the improvement is the utilization of titanium diboride (TiB_2), a material that is wetted by molten aluminum, as the cell cathode. This provides a stable cathode surface, thereby allowing the cell to be operated at a smaller anode-cathode distance (ACD). Energy savings arise as a result of reduced resistive losses through the cryolite electrolyte. This phase of the program is comprised of three integrated parts: (1) materials characterization, (2) pilot cell testing, and (3) a full-sized cell demonstration. During this quarter emphasis continued on rebuilding the 15KA pilot cell to accommodate a highly sloped electrode system. TiB_2 cathode materials were received, and construction of cell components and peripheral equipment was completed.

25797 **(DOE/CS/40287—T1) Air separation by the Moltox process. Interim final report.** Erickson, D.C. (Energy Concepts Co., Annapolis, MD (USA)). Apr 1981. Contract AC01-79CS40287. 51p. NTIS, PC A04/MF A01.

Results are described of a development program on a new and energy-saving process for air separation. The Moltox process involves reversibly reacting oxygen in air with a recirculating salt solution, such that oxygen is extracted without depressurizing the remaining nitrogen. Energy savings of approximately 50% are indicated for this process compared to conventional cryogenic air separation. The development program consisted of design, construction, and operation of a 6 liter/minute pilot plant; optimization of the process flowsheet through computer modelling; investigation of engineering aspects of the process including corrosion, safety, and NO/sub x/ generation; and an economic comparison to conventional cryogenic practice. All objectives were satisfactorily achieved except for continuous operation of the pilot plant, and the modifications necessary to achieve that have been identified. Economically the Moltox process shows a substantial advantage over large scale cryogenic plants which are powered by fuel vice electricity.

25798 **(DOE/CS/40352—T1) Evaluation of potential food applications of dried distillers spent grain (DSG). Final research report.** (American Inst. of Baking, Manhattan, KS). 6 Feb 1981. Contract AC01-80CS40352. 90p. NTIS, PC A05/MF A01.

Results from experimental test bakes indicate that dried distillers spent grain (DSG) can be used to replace up to 15% of the flour for the production of an acceptable variety bread, provided that the DSG is processed under optimum conditions for a satisfactory flavor and color development. The raw materials used for the mash bill may also affect the taste of the finished product. (MHR)

25799 **(DOE/ER/10518—2) Thermoeconomics of energy systems. Progress report, June 1, 1980-May 30, 1981.** Tribus, M.; El-Sayed, Y.M. (Massachusetts Inst. of Tech., Cambridge (USA)). 15 May 1981. Contract AC02-79ER10518. 75p. NTIS, PC A04/MF A01. Order Number DE81023036.

This progress report consists of three reprints on the subject. A paper, Thermoeconomic Analysis of an Industrial Process, was published December 29, 1980. This expository analysis illustrates how to use thermoeconomic techniques to reduce energy use and costs for an industrial process. The example chosen is the final finishing steps in the making of an industrial chemical. The second paper, the Strategic Use of Thermoeconomic Analysis for Process Improvement, was for presentation at the AIChE national meeting in Detroit, Michigan, August, 1981. A strategy is proposed for using thermoeconomics (second law analysis and principles of engineering economy) to find ways to improve process designs. Also included is a Specific Strategy for the Improvement of Process Economics Through Thermoeconomic Analysis, to be presented at the 2nd World Congress of Chemical Engineering, Montreal, Canada, October, 1981. It discusses methods of engineering economy and thermodynamics combined to reveal the cost associated with irreversibility and point the way to design improvements. A numerical example for a gas turbine is given.

25800 **(DOE/RG/10446—T2) Alternative-fuel price trajectories: preparation of MFBI size/usage overlays and new boiler order analysis. Subtask 3.3. Final report.** (Decision Analysis Corp., Annandale, VA (USA)). 15 Jun 1981. Contract AC01-80RG10446. 253p. NTIS, PC A12/MF A01.

Results of a detailed statistical analysis of boiler unit-size and capacity-factor distributions by Standard Industrial Classification (SIC) code and fuel type are presented. This analysis is based on data from the 1975 Survey of Major Fuel-Burning Installations (MFBI's). This report also presents a comparative analysis of new-boiler orders. The purpose of the comparative analysis is to identify emerging trends in boiler unit-size distributions by fuel type relative to the MFBI data for 1974. The principal findings of the MFBI analysis are discussed in Section 2. The results of analysis of the new boiler order data are discussed in Section 3, and Section 4 presents some conclusions from this study, relevant to implementation of provisions of the Fuel Use Act of 1978 (FUA) concerning boiler conversions to coal. Appendix A contains computer output of the MFBI analysis by 2-digit SIC and major fuel within SIC, including all SIC aggregate results, for unit size and utilization in natural units. (MCW)

25801 **(DOE/TIC—11124) Energy-efficient regeneration of granular activated carbon.** (Centec Corp., Fort Lauderdale, FL (USA); Centec Corp., Reston, VA (USA)). 1981. Contract W-31-109-ENG-38. 17p. NTIS, PC A02/MF A01.

Major technologies and options available for reducing the energy required by regeneration systems are discussed. The report outlines energy consumption and losses within the regeneration furnace and identifies the energy conservation methods available. Specifically, thermal regeneration of granular activated carbon is considered.

25802 **(EPRI-EL—1836) Crystallized fly-ash feasibility study. Final report.** (ECP, Inc., El Segundo, CA (USA)). May 1981. 78p. NTIS, PC A05/MF A01. Order Number DE81903308.

A study to determine the feasibility for production and use of crystallized fly ash is presented. The raw materials (fly ash, fluxing, nucleating and crystallizing agents), molten state and crystalli-

zation analysis and characterization of crystallized fly ash are discussed in detail. The development of the process along with the structural and insulation characteristics of the crystallized fly ash as a mechanical support element for electrical conductors are also described in detail.

25803 **Combined generation of electricity and heat in the dairy industry.** Jansen, L.A.; Piersma, H. Luxembourg; Commission of the European Communities (1981). 69p. (EUR—7134-EN).

The feasibility of using a total energy system in the manufacture of powder in the dairy industry is examined. The Coberco skim milk powder plant in Ede is studied. The choice of the type of total energy system; a description of the process; use of a gas or diesel engine; the operating system (island system or a system in parallel with the public supply); potential savings of energy and money; and the influence of variables on the savings are discussed.

25804 **(PB—81-104879) Study on an example of heat supply from waste heat. Final report.** Ebert, G.; Simoneit, H.W. (Wirtschaft und Infrastruktur G.m.b.H. und Co. Planungs-KG, Muenchen (Germany, F.R.)). Dec 1979. 175p. NTIS, PC A08/MF A01.

The report gives a general and basic abstract of the subject, referring to small and medium size sources of waste heat, not within favorable distances to interconnected systems and usable without heat pumps. The main characteristics of waste heat and the demand of potential consumers are shown as well as the technical, economic and legal aspects of the problem. It also deals with the utilization of an existing source of waste heat. Based on the concrete data of the Ebenhausen refuse incineration plant near Ingolstadt, a long-distance heating system supplied by waste heat is technically layed out and economically analyzed.

25805 **(PB—81-113706) Production of beef with minimum grain and fossil energy inputs. Volume III. Input forms for the model. Final report.** Walker, J.N.; Loewer, O.J. Jr; Benock, G.; Gay, N.; Smith, E.M. (Kentucky Univ., Lexington (USA)). Oct 1977. 555p. NTIS, PC A24/MF A01.

A comprehensive program has been developed which enables users to simulate a beef production system for the purpose of advance planning. The bulk of the report comprises data sheets for the model and instructions on how to use them. One page is reserved for a map of the farm to be used for simulation. The map may list initial conditions of each field and serve as a reference when considering various operations performed on each field during the experiment. A calendar is included to aid the user in specifying dates for several operations to be performed by the program. The data sheets cover 83 areas ranging from land resources to trace output. The user must prepare comprehensive information concerning available resources and the management decisions that will be employed to utilize these resources during the simulation.

25806 **(PB—81-115792) Feasibility study: utilization of power plant waste heat and other resources in a proposed oil sunflower seed processing plant. Final report.** (Basin Electric Power Cooperative, Bismarck, ND (USA)). Sep 1980. 137p. NTIS, PC A07/MF A01.

The feasibility study was conducted in two phases. Phase I was preliminary survey of power plant resources and an assessment of the potential to burn oil sunflower seed hulls in the boilers of a full scale generating station. Phase II, the core of study, determined the specific quantities and qualities of the available generating station resources, and address the economics of providing these resources, to the proposed oil sunflower seed processing plant. If results of research in Phase I reveal the technical feasibility was not there, then the project was to be terminated.

25807 **(SAI—444-80-533-LJ) Programmer's manual for the DOEHPE (DOE Heat Pump Efficiency) program.** (Science Applications, Inc., La Jolla, CA (USA)). 23 Oct 1980. Contract AC03-79CS10757. 76p. NTIS, PC A05/MF A01.

This programmer's manual documents the computer code DOEHPE, which is used to calculate air-source-heat-pump seasonal and annual performance factors and energy consumption. The program computes heating seasonal-performance factors (HSPF), seasonal energy-efficiency ratios (SEER), representative regional annual-performance factors (APFR), representative regional annual energy consumption (RAEC), and national annual energy consumption (NAEC) from the standard measurements (rating points) of heat-pump capacity and power input and heat-pump descriptive information as input data. This computer code describes the calculation for single- and dual-speed-compressor heat pumps and single-speed-compressor heating-only heat pumps. Representative regional performance factors (HSPF, APFR, and RAEC, NAEC) are computed for each of six major climatic regions shown for the US, and for each of the DOE standard design heating requirements shown (5000 to 130,000 Btu/h). Section 4.0 presents a more-detailed description of the procedures used.

25808 **Economic analysis of life cycle costing irrigation pipe network design.** Bliesner, R.D. (Keller Engineering, Logan, UT); Keller, J.; Watters, G.Z.; Cone, B.W. *ASAE Publication ;* No. 4-81, 456-460(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Three irrigation systems (solid set sprinkle, trickle and center pivot) were designed using a computerized life cycle costing irrigation pipe network design program for economic life cycles of 5, 10, 15, 20, 30 and 40 years with irrigation demand, interest plus profit, initial energy cost and energy inflation held constant. A comparative economic analysis was made of the designs to determine the impact of economic life cycle on energy usage, capital cost, total annual cost over the system life and annual cost over loan period for the three system types. Since farmers can rarely borrow money for the full economic life of the system, the annual cost over the loan term of a more expensive, energy efficient system may not be affordable. A procedure for examining the extra cash flow required and energy saved by designing for the full economic life as opposed to designing for the shorter loan term is presented as well as one possible method of determining a tax incentive program to encourage the design of more energy efficient systems. For the economic parameters used, a relatively small tax incentive produces a significant energy savings. However, different values for the economic parameters could significantly change the results.

25809 **Efficiency improvements in irrigation well pumps.** Hamrick, J.T. (Aerospace Research Corp., Roanoke, VA). *ASAE Publication ;* No. 4-81, 466-471(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

A program is described for efficiency improvement in well pump systems. The program consisted basically of five parts which were to: (1) analyze an existing commercially available turbine pump and modify it to improve efficiency; (2) demonstrate the use of a water well packer which seals the annulus between the pump and casing allowing delivery of water through the annulus between the casing and column pipe as well as through the column pipe; (3) demonstrate the use of a small, high strength line shaft; (4) provide a means of installing and removing a pump with on the farm tools for easier and less costly maintenance and (5) demonstrate the ability to deliver water to the surface with a system efficiency of 82 percent.

25810 **Computer analysis to compare the energy consumption of variable and constant speed pumps for agricultural irrigation.** Callahan, T.F. (Foster-Miller Associates, Inc., Waltham, MA); Astill, K.A. *ASAE Publication ;* No. 4-81, 472-478(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

A method of analyzing a variety of irrigation systems through the use of a computer simulation is presented. For a given set of field conditions and variable crop water requirements, the conventional constant speed pumping (CSP) plant's energy consumption is compared to that of the variable speed pumping (VSP) plant. A best effort was made to optimize the selection of the pumps for each system. The net energy saved, in kilowatts (kW), is converted to dollars based on average power company charges. The dollar savings generated by matching pump speed to water requirements is then used to demonstrate the VSP system economics

using both a simple payback method (based on fixed dollar value) and the discounted cash flow. A set of sample calculations is made for a typical farm model and watering schedule. The results are given for both CSP and VSP systems and demonstrate how easily the VSP can be optimized to give minimum energy requirements.

25811 **Solar energy utilization in a greenhouse/animal shelter combination.** Spillman, C.K.; Greig, J.K.; Johnson, G.A.; Hartford, J.R.; Koch, B.A.; Hines, R.H. (Kansas State Univ., Manhattan). *ASAE Publication ;* No. 4-81, 573-577(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Two greenhouses are being used at Kansas State Univesity to evaluate use of exhaust air from an animal shelter and its effect on greenhouse production. The control greenhouse is attached to the headquarters building and operated conventionally. The experimental house is attached to a swine finishing building and has air handling equipment to introduce hoghouse air to the greenhouse at 680 m^3/h (400 cfm) or 1200 m^3/h (700 cfm) and has a rock storage system with about 1 m^3 of rock for each 2 m^2 of greenhouse floor space. Cucumber, tomato, and broccoli plants in the experimental greenhouse have darker green foliage than plants in the control house regardless of nitrogen levels. The fall cucumber study indicated a 31 percent increase in number of marketable fruits from the experimental house. Marketable fruits from the experimental house weighed 40 percent more than those from the control house.

25812 **Agricultural energy. Volume 3. Food processing.** St. Joseph, MI; American Society of Agricultural Engineers (1981). 97p. (CONF-8009144—(Vol.3)). $9.50.

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Sixteen papers and thirteen abstracts are included. Separate abstracts were prepared for the papers. The abstracts were listed by title. (MHR)

25813 **Energy aspects and potential energy savings of the new DASI process for milk sterilization.** Frey, B.C. (Univ. of Maryland, College Park); Stewart, L.E.; Chandarana, D.; Wolfson, R.P. *ASAE Publication ;* No. 5-81, 592-597(1981). (CONF-8009144—(Vol.3)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

An experimental study was conducted to determine the difference in total processing energy required by the DASI ultra-high temperature (UHT) system and a conventional high temperature short time (HTST) fluid milk system. Data available in the literature were used to develop an energy use profile for the current US fluid milk system from processor to consumer. The energy data measured and the profile developed were used to estimate the potential energy savings resulting from the introduction of sterile milk in the US fluid milk market. Savings of energy resulting from the introduction of sterile milk were estimated to be 12 million barrels of oil annually.

25814 **Energy conservation in the canning industry.** Pedersen, L.D. (National Food Processors Assn., Berkeley, CA); Rose, W.W.; Jacob, N.L.; Singh, R.P.; Carroad, P.A.; Rumsey, T.M. *ASAE Publication ;* No. 5-81, 598-602(1981). (CONF-8009144—(Vol.3)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Energy audits have been made for spinach, peaches and tomatoes. The processing of these products is representative of the various lengths of operating seasons, and also involves most of the energy intensive unit operations utilized by the food processing industry. The audits demonstrate that steam was responsible for more than 85% of the total energy used, and that of this total most energy was consumed by only a few unit operations. These energy intensive unit operations are blanchers, peelers, evaporators and retorts. Analyses of the data indicate inefficient energy usage in the unit operations in question and show, further, that the major losses of energy occur through steam escape resulting from incomplete steam condensation, as well as from uninsulated surfaces. Initial testing of various methods to improve efficiency indicates that substantial energy savings can be achieved through process modifications and the redesigning of process equipment.

25815 **ALINET: a model for assessing energy conservation opportunities in food processing.** Levis, A.H. (Massachusetts Inst. of Tech., Cambridge); Ducot, E.R.; Webster, T.F.; Levis, I.S. *ASAE Publication ;* No. 5-81, 603-609(1981). (CONF-8009144—(Vol.3)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

ALINET, a network model of the US food processing and distribution sector, has been designed as a tool for analyzing energy use and for evaluating specific energy conserving technologies. The model is operational and has been used in the analysis of wheat processing. The results of a pilot study in which an alternative technology - microwave drying - is introduced in the pasta making process are described, and the impact on energy and on specific fuel use is analyzed.

25816 **Heat recovery/thermal energy storage for energy conservation in food processing.** Combes, R.S.; Boykin, W.B. (Georgia Inst. of Tech., Atlanta). *ASAE Publication ;* No. 5-81, 610-613(1981). (CONF-8009144—(Vol.3)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Based on energy consumption data compiled for 1974, 59% of the total energy consumed in the US food processing industry was thermal energy. The energy-consuming processes which utilize this thermal energy reject significant quantities of waste heat, usually to the atmosphere or to the wastewater discharged from the plant. Design considerations for waste heat recovery systems in the food processing industry are discussed. A systematic analysis of the waste heat source, in terms of quantity and quality is explored. Other aspects of the waste heat source, such as contamination, are addressed as potential impediments to practical heat recovery. The characteristics of the recipient process which will utilize the recovered waste heat are discussed. Thermal energy storage, which can be used as a means of allowing the waste eat recovery process to operate independent of the subsequent utilization of the recovered energy, is discussed. The project included the design, installation and monitoring of two heat recovery systems in a Gold Kist broiler processing plant. These systems recover waste heat from a poultry scalder overflow (heated wastewater) and from a refrigeration condenser utilizing ammonia as the refrigerant. The performance and economic viability of the heat recovery systems are presented.

25817 **Energy reduction in beet sugar processing by cossette liming.** Randall, J.M.; Camirand, W.M.; Neumann, H.J. (Dept. of Agriculture, Berkeley, CA). *ASAE Publication ;* No. 5-81, 654-659(1981). (CONF-8009144—(Vol.3)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Under appropriate conditions of temperature and fresh $Ca(OH)_2$ application, demethylation occurs in the pectin in the cell walls of sugar beet cossettes, allowing Ca^{2+} to precipitate the pectin as calcium pectate. The calcium pectate will not degrade and pass into solution during subsequent hot extraction of sugar from the cossettes. This retention of pectin in the pulp was shown by 10 to 20% increases in solids weight in the pulp for a number of processing conditions. The toughened pulp produced by retention of calcium pectate allowed easier mechanical dewatering of the pulp which could save considerably on the heat normally required to dry the pulp for cattle feed. Beyond data reported in this paper, there are qualitative indications that the sugar juice extracted from limed cossettes is purer than standard juice, for pectin and colloidal materials remain in the pulp. Thus, much less purification of the juice with lime would be necessary than is required in standard beet-sugar processing, and the current 2% CaO used for purification may be cut almost in half. This represents another energy saving, for production of CaO at the factory is a major consumer of energy. These, along with other possible energy savings resulting from cossette liming (such as less water used for extraction, cold extraction, ion exchange of the purer juice), could produce an overall saving up to 20% of the energy currently used in beet-sugar processing. Some of these possibilities will be further investigated.

25818 Energy requirements and equipment for continuous processing of raw foods by gas-exchange. Wheaton, F.W. (Univ. of Maryland, College Park); Kramer, A.; Ehrman, L. *ASAE Publication ;* No. 5-81, 660-664(1981). (CONF-8009144—(Vol.3)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Equipment was developed to treat raw foods by gas-exchange in sufficient quantities to supply test samples for extensive laboratory tests. Design constraints were noted and the equipment and its operation described. Energy consumption measurements taken on the operating gas-exchange equipment were used to compare energy consumption in gas-exchange, freezing and canning processes. Energy savings of up to 43 percent were estimated for gas-exchange processing versus canning and freezing in a production to consumer food supply system.

25819 Stabilization and gasification of soft-drink manufacturing waste by conventional and two-phase anaerobic digestion. Ghosh, S.; Henry, M.P. Chicago, IL; Inst. of Gas Tech. (1981). 16p. (CONF-810577—1).

From 36. annual Purdue industrial waste conference; Lafayette, IN, USA (12 May 1981).

Energy recovery and waste stabilization accomplished simultaneously in the beverage industry by anaerobic digestion are investigated. The applicability and limitation of the conventional high-rate anaerobic digestion process are tested. A rapid-rate waste conversion process, two-phase anaerobic digestion, developed for enhanced net energy production with COD reduction comparable to that obtainable by application of a conventional digestion process is discussed. The high-rate digestion run was developed from a mixed MSW-sludge-biomass-fed inoculum.

25820 Alleviation of environmental problems of waste disposal with production of energy and carbon dioxide. Ghosh, S. Chicago, IL; Institute of Gas Technology (1981). 16p. (CONF-810487—1).

From 28. annual meeting of the Society of Soft Drink Technologists; Colorado Springs, CO, USA (26 Apr 1981).

Each year the soft-drink-bottling industry generates about 10 billion gallons of liquid wastes nationally. The energy content of raw soft-drink wastes may range from about 1500 Btu/gal to 2800 Btu/gal, depending on the manufacturing process and the types of drinks bottled. Recovery of this energy could satisfy from 60% to 100% of the process energy demand. Since the waste has a moisture content of 95% or higher, only biochemical energy-conversion processes are suitable for this purpose. Anaerobic digestion appears to be more suitable for application to soft-drink industry waste conversion than other biochemical processes because it produces a readily usable clean fuel, methane, and simultaneously, significantly reduces the waste's biological oxygen demand. In comparing conventional vs two-phase digestion processes, it was found that the latter could be operated at 3 times the loading rate and one-half the hydraulic retention time of the former and still obtain the same methane production as a slightly higher chemical oxygen demand (COD) reduction than the conventional process. An additional advantage of the two-phase process was that gases from the methane phase of the two-phase system had a higher methane content and heating value than the conventional high-rate process. In view of its technical and economic merits, the two-phase digestion process should be developed through further process-development work and pilot-plant operation, and applied to soft-drink-industry wastes to accomplish the dual objectives of energy and CO_2 recovery and waste stabilization. 6 references, 1 figure, 8 tables.

25821 Economics of selected fuels for new industrial steam capacity. Klepper, O.H. (Oak Ridge Natl Lab, Tenn). *American Society of Mechanical Engineers, [Paper] ;* No. 80-IPC-Pwr-5, 11(Oct 1980).

A number of established and proposed fuels for industrial steam production have been reviewed to assess their future economic potential for new installations. Retrofit applications to existing systems were not considered. The following fuels were selected: coal for conventional- and fluidized-bed firing, low-, medium-, and high-Btu gas, coal-oil mixture (COM), methanol; oil and natural gas were also included for reference purposes. 11 refs.

25822 Perspective on alternative electric power sources. Davis, W.K.; Sandberg, R.O. (Bechtel Power Corp, San Francisco, Calif). *IEEE (Institute of Electrical and Electronics Engineers) Transactions on Power Apparatus and Systems ;* **PAS-99**: No. 5, 1780-1787(Sep-Oct 1980).

Paper No. F79 268-4.

25823 (GESP—785) Pipeline bottoming-cycle study: technological feasibility of the bottoming cycle. Task IIIC report. (General Electric Co., Cincinnati, OH (USA). Advanced Energy Programs). [nd]. Contract AC03-77CS51381. 34p. NTIS, PC A03/MF A01. Order Number DE81024309.

The technological feasibility of organic Rankine bottoming cycles in the 5000 to 6000 HP range applied to the conservation of waste heat from pipeline gas turbines is discussed. Included are discussions of the environmental and safety aspects of the working fluids and assessments of the current 600 to 800 HP organic Rankine systems under development. Bottoming cycles are technologically feasible since at least three systems (with a maximum power of 800 HP) are being demonstrated this year and bottoming cycle components for the large size machines are available from commercial suppliers. However, a large size (5000 to 6000 HP) organic bottoming cycle for a gas turbine has yet to be demonstrated on a domestic pipeline.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 25181, 25183, 25187, 25188, 25199, 25200, 25201, 25203, 25205, 25408, 25617, 25620, 25621, 25622, 25629, 25630, 25892, 26054, 26055, 26056, 26057, 26058, 26300

25824 (ANL/CNSV-TM—60, pp 17-23) **Implementation of a resource recovery program: full service approach.** Christensen, H.F. Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The County of Monroe, an urban upstate New York County with a population of aproximately 750,000, recognized an impending refuse disposal problem in 1971. A number of studies had been conducted by a variety of consultants and governmental bodies in previous years dating to the early 1950's, each with a major reliance placed on incineration and landfilling. With emerging environmental awareness and regulation, these recommended practices were not looked upon favorably and the community issued a cry for a more environmentally sound method of waste disposal. Resource Recovery and recycling were phrases of the day and the Rochester Engineering Society was petitioned to analyze the state of current technology through a volunteer work force. Their report subsequently became the basis for solid waste management activities in the County of Monroe. An early-on philosophy of sole-source of responsibility for design, costruction and operation for whatever course of action to be embarked upon was adopted. Although the turn key process was considered in the beginning, State of New York General Municipal Laws precluded this consideration and would have eliminated eligibility for a State grant in-aid.

25825 (ANL/CNSV-TM—60, pp 25-35) **Development and implementation of prepared solid waste fuels to energy projects through the architectural/engineering approach.** Boley, G.L. (Wisconsin Solid Waste Recycling Authority, Madison). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

In January 1977, the City of Madison and the Madison Gas & Electric Company, a local privately owned utility, entered into a ten-year agreement to fire prepared municipal solid waste (refuse-derived fuel) in suspension with pulverized coal to produce steam for electric power generation. The City of Madison's implementation responsibilities included the arrangement for and financing of the remodeling of the City of Madison's Olin Avenue Refuse Processing Plant to produce a refuse-derived fuel (RDF) and to design, construct and finance the RDF receiving station to suspension fire RDF into the two (2) utility boilers. The City elected to implement the project by utilizing a modified architectural/engineering (A/E) approach in which the City, in effect, was the general contractor and took full responsibility for its implementation.

25826 (ANL/CNSV-TM—60, pp 155-161) **Reducing explosion damage in primary and secondary refuse shredders.** Haverland, R.A. (Systems Technology Corp., Xenia, OH). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The article is a general overview on the problem of refuse shredders. Differences between explosions in primary and secondary shredders are briefly discussed. A description of the various alternatives for reducing explosion damage in refuse shredders is also detailed, concluding with specific recommendations for the reduction of shredder explosions.

25827 (ANL/CNSV-TM—60, pp 243-271) **ECO-FUEL/sup R/II: the third generation.** Hasselriis, F.; Master, H.; Konheim, C.; Betzig, H. (Combustion Equipment Associates, Inc., New York, NY). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Municipal solid waste, at 600 tonnes per day, has been converted at Bridgeport, Connecticut, by embrittling and hot ball milling, to ECO-FUEL/sup R/II (ECO-FUEL), a dry powdered fuel. The free flowing ECO-FUEL, devoid of troublesome cellulosic fibers, is readily stored, transported, pneumatically conveyed and precisely metered to burners. Co-firing with residual oil has exceeded 51% without apparent loss of boiler efficiency. The low ignition temperature and high volatile content of ECO-FUEL improves oil combustion, and reduces NOx. Stack emissions are within State permitted conditions. Furnace slag flows readily, and routine soot blowing removes superheater deposits. Operating experience was reviewed to develop the third generation process. Better materials separation and size reduction techniques will result in greater simplicity, reliability, safety, economy and minimum downtime. The process may be piggy-backed to RDF fluff processes to maximize fuel value. One tonne of ECO-FUEL is equivalent to 2.82 barrels of oil. the fuel sold for $3.43 per million kJ.

25828 (ANL/CNSV-TM—60, pp 273-283) **Role of the consulting engineer in the implementation of resource recovery systems.** Anderson, W.C. (Pickard and Anderson, Auburn, NY). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

In order to answer the question what strategy is best for implementary resource recovery systems, a pilot study was performed. The pilot study surveyed 4 municipalities and had as its objectives: (1) to explore the process by which municipalities adopt and implement resource recovery systems; (2) to compare the various implementation strategies currently used; (3) to determine the feasibility and practicality of conducting a larger scope project using survey research methods; and (4) to develop some instruments and research procedures that could be used in a more comprehensive analysis. The architectural/engineering approach, turnkey, or full service strategies are considered. From the results of the pilot study it is safe to conclude that there is no one best implementation strategy. The best strategy for a community depends upon the attributes of the strategy, how municipal decision makers weigh these attributes and the characteristics of the municipality and the type of system under consideration. The pilot study did not examine enough communities to determine any commonalities in how attributes are weighted. However, the results of the pilot study suggest that the selection of an implementation strategy can be as important, albeit a potentially complicated decision, for municipalities as the selection of a resource recovery system.

25829 (ANL/CNSV-TM—60, pp 319-346) **RDF fuels in a waste-to-energy system -- the Teledyne National experience.** Shepherd, K.R. (Teledyne National, Northridge, CA). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Teledyne National (herein referred to as TN) was formed as a new operating entity of Teledyne, Inc. in March, 1974 to pursue resource recovery. It has been actively involved in designing, constructing and operating resource recovery projects since then. Three (3) facilities currently being operated by TN will be described in this paper. While TN is a systems company with no proprietary equipment or primary processes, our operating experience to date is primarily with Refuse Derived Fuel (RDF) systems. Since several large RDF systems have experienced difficulty, a question has been raised by some as to whether such systems are technically viable, reliable and economically attractive. This paper intends to deal with this question in light of TN's considerable experience with these systems.

25830 (ANL/CNSV-TM—60, pp 347-363) **Advantages of the hydrasposal process as applied to the Hempstead Resources Recovery Plant and the Dade County Solid Waste Recovery Plant.** Plato, C. (Hempstead Resources Recovery Corp., Garden City East, NY). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The Hempstead Resources Recovery Plant and the Dade County Solid Waste Recovery Plant convert municipal solid waste to electric power while recovering salable material. Both facilities employ the Hydrasposal Process, a wet separation process developed by Black Clawson Fibreclaim Inc., a subsidiary of Parsons & Whittemore Inc. The potential energy conservation offered by the Hydrasposal Process exceeds for each of the two plants the equivalent of more than one million barrels of oil per year. The environmental advantages of the Hydrasposal Process are, besides no liquid effluent, less ash, less flue gas, less emission of particulate, hydrocarbon, and trace elements than from a conventional mass burning of municipal refuse. The Hydrasposal fuel is for all practical purposes homogeneous and permits combustion in suspension at higher temperatures during longer periods of residence than does ordinary incineration thus surpassing the requirements for a thermal decomposition of dioxins. Should any escape the decomposition, it would be substantially eliminated from the flue gas in a highly efficient emission control system.

25831 (ANL/CNSV-TM—60, pp 365-387) **New generation - the Flakt recovery system.** Johansson, P.O. (Flakt, Inc., Old Greenwich, CT). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Incineration is not a satisfactory solution for processing solid wastes. The most sound solution is to recover the materials suitable for sale or for recycling. Flakt has three such plants in successful operation, where the recovered materials virtually impurity-free, generate substantial income and the residuals are used as a fuel.

25832 (ANL/CNSV-TM—60, pp 469-482) **Private sector viewpoint of waste flow control for the DOE/EPA conference on prepared fuels and resource recovery technology.** Budoff, H. (Hybud Equipment Corp., Akron, OH). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

In December 1976, the city of Akron, Summit County, and the Ohio Water Development Authority (OWDA) entered into a cooperative agreement to enable the OWDA to sell $46,000,000 worth of revenue bonds so the City could develop a recycle energy system. To fulfill its obligations under the agreement, the City enacted Ordinance No. 846-1976. The city built the RES to solve its solid waste disposal problem. A number of factors, including Ohio Edison's desire to stop generating steam from the downtown business district, caused the city to decide the RES was the best alternative available to solve the waste disposal problem. The underwriters decided it was necessary to assure a supply of waste to the RES in order to market the revenue bonds. After learning this, the city and the OWDA concluded that it would be necessary to require that all waste collected within the city limits would be taken to the RES. Upon being made aware of the restrictive nature of the ordinance, Hybud decided that a law suit should be filed in federal court challenging its constitutionality. Such action was filed in the US District Court Northern District of Ohio Eastern Division and was heard by Judge Contie. A decision was rendered, which was felt to be incorrect and at present an appeal is pending in the US District Court of Appeals in Cincinnati.

25833 (ANL/CNSV-TM—60, pp 483-488) **Waste flow control - the public perspective.** Hunt, T.F. Jr. (Palm Beach County Solid Waste Authority, West Palm Beach, FL). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Until the evolution of resource recovery as a serious part of solid waste management the ownership of waste and its control was of little interest. With resource recovery now being seriously considered by many communities ownership of wastes and its control has become a major issue in solid waste management. Local government control of solid waste began as a means to protect the public health. With the advent of environmental concerns the role of government in solid waste management became even more pronounced. While the delivery of solid waste management services may be done by either publicly or privately owned and operated systems, government retains the ultimate responsibility for protection of the public interest. Successful resource recovery projects have in almost all instances depended upon government providing the incoming wastes. This can only be accomplished by some forms of waste flow control. Consequently, rather than waste flow control being a point of conflict between government and industry, it is a necessary part of the successful implementation of resource recovery.

25834 **(BNL—29282) Potential role of district heating in the US.** Powell, J.R.; Karkheck, J. (Brookhaven National Lab., Upton, NY (USA); State Univ. of New York, Stony Brook (USA)). 1981. Contract AC02-76CH00016. 8p. (CONF-810808—3). NTIS, PC A02/MF A01.

From Energy in the man-built environment: the next decade specialty conference; Vail, CO, USA (3 Aug 1981).

The potential market penetration of district heating in the US is discussed. Estimates of optimal service levels, capital investment, and energy conservation potential are discussed. The technological concept of modern district heating and specific assessments of district heating in the US are briefly described. (MCW)

25835 **(CONF-7909198—) ELMIA-AVFALL 79.** (Elmia AB, Joenkoeping (Sweden)). 1979. 838p. NTIS (US Sales Only), PC A99/MF A01.

From International trade fair on recycling, refuse collection and waste treatment; Jonkoping, Sweden (17 Sep 1979).

Fifty papers are included under the following topical headings: heat treatment of waste combined with production of heat, gas, and electricity; composting of waste; research, development trends and usual practice in the field of wastes; waste recovery; and hazardous waste. Separate abstracts were prepared for the papers. (DLC)

25836 (CONF-7909198—, pp 285-299) **Compost from sludge and refuse: applications and quality requirements.** Berglund, S. (National Environment Protection Board, Solna, Sweden). 1979. NTIS (US Sales Only), PC A99/MF A01.

From International trade fair on recycling, refuse collection and waste treatment; Jonkoping, Sweden (17 Sep 1979).

Effects of compost on soil and vegetation and its leaching were studied. Agricultural and revegetation uses of compost are discussed. Marketing of compost is discussed briefly. Compositions of compost and related products are given. 8 tables. (DLC)

25837 **(DOE/CE/20088—01) Cannon shredding of municipal solid waste for the preparation of biological feedstock. Final report.** Burke, J. (Philadelphia Zoological Society, PA (USA); Burke, Davoud and Associates, Richmond, VA (USA)). Apr 1981. Contract FG01-79CS20099. 44p. NTIS, PC A03/MF A01. Order Number DE81025850.

This study explores explosive decompression as a method of size reduction of materials found in municipal solid waste (MSW) and to gather preliminary data related to the handling and wet separation of exploded material. Steam was emphasized as the source of pressure. Municipal refuse was placed in an 8-ft-long, 10.75-in.-ID steel cannon, which was sealed and pressurized. After an appropriate time, the cannon muzzle closure was opened and the test material expelled from the cannon through a constrictive orifice, resulting in explosive decompression. Flash evaporation of pressurized saturated water, expansion of steam, and the strong turbulence at the cannon muzzle accomplished size reduction. Hydraulic processing was shown to be an effective technique to separating heavy and light fractions.

25838 **(DOE/CE/20237—1) Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, Glendale, California. Final report.** Lofy, R.J. (Lockman and Associates, Monterey Park, CA (USA)). Jun 1981. Contract AC01-79CS20237. 55p. NTIS, PC A04/MF A01. Order Number DE81025848.

A project to evaluate the technical and economic feasibility of direct onsite conversion of landfill gas into electrical energy for distribution through the municipal company's distribution grid in Glendale, California, is described. The various approaches were evaluated with respect to technical feasibility and adequacy of existing state-of-the-art equipment, relative costs of implementation, market criteria, and integration with existing or planned subsystems and components of the total energy distribution system. After thorough evaluation of the technical, economic, and institutional constraints impacting each alternative, conceptual designs of the desired screened alternatives were made. Each of the conceptual systems looked at the preliminary collection system layout, type of processing, and conversion equipment required, conversion efficiencies, total system costs, total energy output per input landfill gas, and overall economic comparisons between alternatives. This led to the selection of the most practical alternative, the internal combustion engine. A nontechnical investigation of various constraints that could impact the proposed project was conducted. This investigation looked into the legal constraints on interdepartmental transfers of money and resources, city procedures for coordination between the Public Works Department and Public Services, procedures for facility operation, and an environmental assessment of each alternative. Viable financing methods that were compatible with the city's financial posture and its allowable methods of financing various projects were explored. (MCW)

25839 **(DOE/CS/20156—T1) Resouce recovery option in solid-waste management: a review guide for public officials .** Nemeth, D.M. (American Public Works Association, Chicago, IL). Apr 1981. Contract FC01-80CS20156. 51p. NTIS, PC A04/MF A01.

The purposes of this document are to: serve as a guide for public-works directors and others interested in implementing resource-recovery systems; and (2) provide background material that can be used in presenting information on resource-recovery systems to city managers, mayors, legislative bodies, and citizen advisory groups. It raises some issues of which local communities must be aware before developing resource-recovery systems. Additionally, the document: (1) focuses on possible institutional problems that may arise in planning waste-to-energy systems and presents some solutions and alternatives, and (2) serve public-works officials as a reference for other publications on resource-recovery systems. It will aid public-works officials in the decision-making process concerning the implementation of waste-to-energy systems. Members of the public works profession who are fully aware of all the implementation procedures involved with resource-recovery systems can best decide if this is a feasible solid-waste-management option for their community.

25840 (EPA/600/9—81-019B, pp 603-623) **Evaluation of potential impacts to the utility sector for compliance with RCRA.** Weaver, V.E. (Dept. of Energy, Washington, DC). 1980. NTIS.

From Symposium on flue gas desulfurization; Houston, TX, USA (28 Oct 1980).

This paper presents interim findings of a continuing evaluation of the impacts on coal-fired electric generating facilities in the utility sector deriving from Proposed Rules issued by EPA for implementing Sections 3001, 3002, and 3004 of RCRA Subtitle C (18 December 1978) and Proposed Guidelines under Section 4004 (6 February 1979) and Section 1008 (26 March 1979). Cost analyses were made on direct costs only and presented in 1979 dollars. The primary purpose for undertaking this study was to assess RCRA's impacts on coal-fired utilities as a means to understanding the impli-

cations of RCRA regulations on the National Energy Plan (NEP), the Powerplant and Industrial Fuel Use Act of 1978 (PIFUA), which gives DOE authority to enforce coal conversion actions, and on utilities. Ultimately, this information can be used to understand and determine RCRA's implication on the Department of Energy, Fossil Energy, mission objectives of developing programs and supporting advanced technologies which will promote greater utilization of coal in an environmentally acceptable manner. Preliminary national costs for waste disposal, based on direct costs alone, reflected an increase in disposal costs of over 4 times for non-hazardous and over 13 times for hazardous disposal. This results in a cost increase of from 1.09 to 3.2 mils per kwh of power generated (in terms of 1979 dollars).

25841 **(LBL—12595) Energy savings with solid-state ballasted high-pressure sodium lamps.** Verderber, R.R.; Morse, O. (Lawrence Berkeley Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 32p. (CONF-810590—1). NTIS, PC A03/MF A01. Order Number DE81023202.

From Annual Edison Electric Institute conference; Philadelphia, PA, USA (1 May 1981).

The performance of three types of solid-state ballasts used to operate high-pressure sodium lamps is discussed. Each type of solid-state ballast has been designed to operate an HPS lamp of a different wattage (150, 200, and 400 watts). The performance of these ballasts compared to standard core-coil ballasts operating the same HPS lamps shows that system efficiency improves as much as 17%. The solid-state ballasted HPS system also demonstrates excellent regulation with respect to input voltage and output power. These new ballasts can dim the HPS lamps and reduce flicker from more than 60% to less than 3%. Refitting street lighting with these new HPS systims provides an attractive return on initial capital investment.

25842 **(PB—81-107575) Block grant energy conservation.** (Department of Housing and Urban Development, Washington, DC (USA). Office of Community Planning and Development). Apr 1980. 58p. NTIS, PC A04/MF A01.

This publication describes energy - related Community Development Block Grant (CDBG) programs in 10 communities. The report is designed to depict the rudiments of various possible responses under CDBG to a range of local energy needs and to widen interest among CDBG users for incorporating solar, conservation, and alternative energy systems into their ongoing housing, community, and economic development processes. Although CDBG is not an "energy program" per se, neighborhood and commercial revitalization strategies which anticipate future energy prices in their project design and financing are encouraged. CDBG recognizes that significant changes toward conservation and alternative energy sources are warranted in every sector, from households to city hall, and offers the reports in this publication as examples of imaginative initiatives taken by individual communities to address a diverse array of energy problems. These projects evolved along with the normal course of CDBG procedures and regulations through advance energy planning, the adoption of conservation ordinances and administrative policies, and programs of assistance for weatherization. The narrative profiles have been arranged to highlight the key elements of each community's approach. Each description lists the program location, specific technology, problem addressed, community background, CDBG program solution, institutional arrangements, and project strategy. Also indicated are the names, locations, and phone numbers of local contact persons. Interagency cooperation features and special difficulties and accomplishments are also noted. Special attention is paid to feasibility studies and energy auditing. Among the energy problems addressed were weatherizations and several solar heating and cooling approaches.

25843 **(PB—81-110918) Obtaining improved products from the organic fraction of municipal solid waste. Final report.** Hecht, N.L.; Duvall, D.S.; Ghazee, A.A.; Fox, B.L. (Dayton Univ., OH (USA). Research Inst.). Aug 1980. 126p. NTIS, PC A07/MF A01.

This project has investigated several processes for the conversion of the organic fraction of municipal solid waste (MSW) to a powder. The study concentrated on two types of processes: (1) conversion of MSW to a powdered carbon char by low-temperature pyrolysis, and (2) embrittlement of cellulose waste by thermal-chemical treatment. This report describes results of these studies. The first phase of this project was devoted to identifying processes that offer a potential for enhanced product recovery, an evaluation of chemical treatment to improve carbon recovery from pyrolysis processes, an evaluation of laboratory processes for the production of gaseous and liquid fuels, and a laboratory investigation of embrittlement processes for cellulose wastes. The second phase of the program was concerned with further laboratory studies of the embrittlement process, pilot studies of the embrittlement process with shredded newsprint and refuse derived fuel, and an engineering and economic assessment for a plant to process powdered cellulose for use as fuel. A comprehensive description of Phase I was presented in an earlier report entitled 'Investigation of Advanced Thermal Concepts for Obtaining Improved MSW-Derived Products' (EPA-600/7-78-143). This report summarizes the results of Phase I and provides a comprehensive review of the work conducted in Phase II of the program.

25844 **Refuse-derived fuels.** Krause, H.H. (Battelle, Columbus Lab, Ohio). *American Society of Mechanical Engineers, [Paper] ;* No. 80-JPGC/Fu-2, 9(1980).

The rationale for energy recovery from municipal refuse is discussed, and planning for future installations for this purpose is cited. The composition and energy content of bulk waste, shredded refuse, and pelletized material are compared. Potential problems encountered with refuse combustion in the areas of slagging, corrosion, and stack emissions are outlined. 14 refs.

25845 **Overview of the Department of Energy program for the recovery of energy and materials from urban solid waste.** Walter, D.K. (Dept. of Energy, Washington, DC). *ACS (American Chemical Society) Symposium Series ;* No. 130, 1-12(1980). (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

The primary mission of the Department of Energy Urban Waste Program is to promote energy conservation through the widespread use of urban solid waste as a source of energy and materials. Specifically, the Urban Waste and Municipal Systems (UWMS) Branch seeks to replace conventional fuels with the energy recovered from urban solid wastes; replace virgin materials with materials recycled from urban solid waste; and reduce the amount of energy used in urban waste treatment and disposal. In pursuing its mission to achieve maximum development of the resource potential of urban solid wastes, the UWMS Branch undertakes activities in three areas: technical processes; institutional impediments to waste use; and program (monetary) support. These areas, although logically separable, are highly interrelated and underline the Branch strategy to demonstrate promising energy recovery technologies at a commercial scale in a variety of institutional settings. This strategy is aimed at assisting public and private entities to conserve energy by utilizing the resources contained in their urban solid wastes; it focuses on existing impediments to the implementation of energy recovery projects. The program activities - in technical processes, institutional impediments to waste use, and program support - address the problems that hinder progress in demonstrating resource recovery technologies. The following discussion attempts to describe the breadth of Branch activities in these areas.

25846 **Mass burning of municipal solid waste - worldwide.** Beltz, P.R. (Battelle Columbus Labs., OH). *ACS (American Chemical Society) Symposium Series ;* No. 130, 59-66(1980). (CONF-790917—P5).

From American Chemical Society national meeting; Washington, DC, USA (10 Sep 1979).

Municipal, commercial and light industrial waste is converted to energy daily in about 450 mass burning facilities worldwide. Of these, less than 20 operate in the USA. Realizing this fact, the US EPA Office of Solid Waste developed a study program titled, Evaluation of European Refuse Fired Energy Systems Design Practices. This paper presents research conclusions. The major conclusion is that the mass burning of unprepared municipal solid waste in heat recovery boilers is well established, and can be a technically reliable, environmentally acceptable and economic solution to the problem of disposal of solid wastes. It is not as cheap as

is currently available landfilling. However, when the cost is considered of upgrading current landfills and establishing new landfills in accordance with the expected Resource Conservation ad Recovery Act (RCRA) provisions, these mass burning waste-to-energy systems are expected to compare more economically with true sanitary landfills. Many conditions in the US have been different, hence waste-to-energy has not advanced as rapidly as in Europe. Some of these differences will continue, but we are moving rapidly to similar conditions in most of our metropolitan areas. Hence the lessons that have been learned in 80 years of refuse fired energy plant (RFEP) experience in Europe can be effectively utilized by many US communities.

3209 Education And Public Relations

REFER ALSO TO CITATION(S) 25217

25847 (CONF-7910214—, pp vp, 21p) **Motivation: its role in energy conservation.** Jones, J.E. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

The program at International Kaiser Aluminum and Chemical Corporation to motivate people by emphasizing the importance of the individual to save energy is described. Three major areas of conservation in the industry considered important since they identify the different motivational approaches needed that are discussed are manufacture, recycling, and by conversion to energy saving products. The importance of communication, participation, and recognition are emphasized. (MCW)

25848 (CONF-7910214—, pp vp, 9p) **Further education and training.** O'Malley, C. 1979. NTIS (US Sales Only), PC A25/MF A01.

From International energy management conference; Birmingham, UK (9 Oct 1979).

Energy managers have a commitment to employers and to future generations and to the nation to become equipped to handle energy problems. The availability of seminars and training courses is noted.

25849 **(DOE/CS/10210—T2) Handbook for the marketing of conservation and solar-energy programs.** Mick, C.K.; Callahan, D. (Applied Communication Research, Inc., Palo Alto, CA (USA)). 9 Jul 1980. Contract AC01-77CS10210. 90p. NTIS, PC A05/MF A01.

A process-oriented approach is described for encouraging community level energy conservation and planning programs. The approach is designed to augment existing energy programs by focusing on the major barriers to changing current energy-related behavior and attitudes. A variety of concepts, tools and techniques which can be used to overcome these barriers are described. Suggestions are offered on how to design community energy campaign based on the concepts, tools and techniques described. Some brief case studies are provided as examples. (LEW)

25850 **(DOE/ER—0103) Guide for the preparation of proposals for faculty development projects in energy education, 1982.** (Department of Energy, Washington, DC (USA). Office of Energy Research). 1981. 47p. NTIS, PC A03/MF A01.

The specific objectives of the Faculty Development Project are to make available factual data and information relating to energy technologies, research, resources, and usage, and to expedite the incorporation of energy subject matter into the nation's schools. Offerors may propose development projects for summer workshops or academic year workshops or both. Criteria and specifications for preparing and submitting proposals are described. Rules on which the proposals will be evaluated and selected are described.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 25886, 25893, 25894

25851 **(AD-A—090142) Engine tests using high-sulfur diesel fuel. Final report.** Frame, E.A.; Moon, R.B. (Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.). Sep 1980. Contract DAAK70-79-C-0215. 113p. NTIS, PC A06/MF A01.

This report covers the engine test evaluation of an organozinc additive for its effectiveness in combating the deleterious effects of using high-sulfur diesel fuel in a two-cycle U.S. Army diesel engine. The report also covers the 6V-53T testing of a preservative engine oil which in previous testing had shown promise in controlling the effects of using high-sulfur fuel.

25852 **(AD-A—090280) An automatic isokinetic sampler for particulate emissions from aircraft gas turbine engines. Final report Feb 75-Jun 78.** Dehne, H. (Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.). Jan 1980. Contract N00123-75-C-1075. 37p. NTIS, PC A03/MF A01.

An automated isokinetic sampler for evaluating particulate emissions from aircraft gas turbine engines was designed, constructed and tested. The sampler is capable of collecting the particulate mass emitted by an aircraft gas turbine at the exit plane (non-afterburner operation) for gravimetric measurements and permits simultaneous on-line particle size distribution measurements to be performed. The particulate is collected on a fiber glass filter for gravimetric measurement. The size distribution is determined by conditioning the gas turbine exhaust gases and passing them through a mobility particulate size distribution analyzer. The sampler has two-axis traverse capability and a maximum sampling capability of 226 l/min (8 scfm). Test data are automatically recorded. Control of the sampler is by means of 12-bit microprocessor. Preliminary tests were performed at the Naval Air Rework Facility, Alameda, California, at various construction stages of the sampler to evaluate its performance and to measure the effects of fuel additives on particulate emissions on a TF41 gas turbine engine.

25853 **(AD-A—090282) USAF aircraft engine emission goals: a critical review. Final report Sep 78-Jun 79.** Boubel, R.W.; Martone, J.A. (Air Force Engineering and Services Center, Tyndall AFB, FL (USA). Engineering and Services Lab.). Sep 1979. 211p. NTIS, PC A10/MF A01.

This report is a comprehensive summary and analysis of proposed aircraft turbine engine air pollution regulations and their relevance to the USAF. Existing USAF aircraft turbine engine emission goals are critically reviewed, and revised goals are proposed. The original goals contained emission standards and compliance dates; the proposed goals contain neither, The authors believe that the goals should be set to provide an incentive for emission reduction and should not be numerical standards and dates, which may or may not be met. The proposed USAF goals cover the critical turbine engine emissions. Carbon monoxide and oxides of sulfer are not considered serious problems at today's emission levels, while smoke and hydrocarbon emissions appear to warrant the highest priority for reduction. Although cost effective oxides of nitrogen control (NO sub x) is viewed with pessimism, it is concluded that NO sub x reduction deserves continued USAF research. (Author)

25854 **(AD-A—090337) A three-dimensional model of spray evaporation in gas turbine combustors. Interim report.** Ayers, W.H. (Sheffield Univ. (UK). Dept. of Fuel Technology and Chemical Engineering). Apr 1980. 36p. NTIS, PC A03/MF A01.

The result of this study is a computer program which can calculate the trajectory of a droplet or particle in three dimensions in a three dimensional flow field. Droplets are injected into a computer predicted flow field in a gas turbine combustor can with initial conditions corresponding to the point of sheet break up of fuel

leaving the atomizer being modeled. The fundamental equations of motion are solved numerically for each droplet size in a statistical distribution representing the whole spray. The angular position of the point of injection is also varied.

25855 **(AD-A—090408) The response of turbine engine rotors to interference rubs.** Kascak, A.F. (Army Research and Technology Labs., Cleveland, OH (USA). Propulsion Lab.). Jun 1980. 15p. NTIS, PC A02/MF A01.

In a typical aircraft gas turbine there are many instances in which rotor rubs occur. Two of the most common are blade tip and seal rubs, which are caused by thermal mismatch, rotor imbalance, high 'g' maneuver loads, aerodynamic forces, etc. Current interest in fuel efficiency is a consideration which drives the engine design toward closer operating clearances. Thus increasing the probability of rotor rubs. The interaction of a rotor with its case, (rotor rubs), has been studied. A steady state interaction between a rotor with a rigid case neglecting friction at the interface and a steady state interaction between a linear flexible rotor and case including friction at the interface were studied. The critical transient situation in which the rotor bounces off the case was not considered. It is known that rotor rubs can have an important effect on the rotor dynamics. When a rotor rubs on the case, a frictional force is generated which can drive a rotor to whirl in a direction opposite to the direction of rotation, (backward whirl). This frictional force is relatively constant up to the backward whirl speed at which the rotor rolls around the case. Since this rolling contact speed is proportional to the rotational speed of the rotor times the ratio of the diameter to the rotor clearance, the whirl speed can be hundreds of times the rotational speed of the rotor; and thus be potentially very dangerous.

25856 (DOE/BETC/IC—80/3(Vol.4), pp 11p, Paper 17) **Maximizing efficiency of fuel production and utilization.** Koehler, D.E.; Marshall, W.F. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

An experimental study was undertaken to determine the influence of fuel octane quality, engine compression ratio, and ignition timing adjustment on fuel utilization efficiency. This information, combined with data on refinery energy consumption for producing fuel of various octane qualities, can be used to estimate the potential for improvement in miles traveled per barrel of crude oil consumed. The vehicle selected for this investigation incorporated a closed-loop, air/fuel ratio control system using an oxygen sensor and a three-way catalyst. Ignition timing was adjusted for minimum fuel consumption at each of three compression ratios with the engine operating on fuels of various octane quality. An ignition timing retard system was used for those combinations of compression ratio and fuel quality which precluded use of best ignition timing. Results indicate that a 13% improvement in miles traveled per barrel of crude oil consumed is possible.

25857 (DOE/BETC/IC—80/3(Vol.4), pp 8p, Paper 18) **Automotive fuel economy: potential improvement through selected differential gear lubricants.** Naman, T.M. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

An experimental program was conducted at the US Department of Energy's Bartlesville (Olka.) Energy Technology Center to evaluate the effects of synthetic and special additive differential gear lubricants on automotive fuel economy over the temperature range encountered in the United States. Using a climate-controlled chassis dynamometer facility, three differential gear lubricants were evaluated in steady-state operation from cold start at 20°, 70°, and 100°F ambients using one 1978 vehicle equipped with torque and revolutions per minute measuring devices, which enabled the calculation of horsepower losses in the differential and the efficiency of the rear axle in addition to fuel enconomy. The results from steady-state operation showed increased fuel economy with the synthetic and friction-modified 75W gear oils at all ambients only during vehicle warm-up from cold start.

25858 (DOE/BETC/IC—80/3(Vol.4), pp 10p, Paper 19) **Automotive fuel economy: potential improvement through selected engine lubricants.** Naman, T.M. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

An experimental program was conducted at the US Department of Energy's Bartlesville (Okla.) Energy Technology Center to evaluate the effects of synthetic and special additive engine lubricants on automotive fuel economy over the temperature range encountered in the United States. Using a climate-controlled chassis dynamometer facility on two 1978 vehicles, four engine lubricants were evaluated in the 1978 Federal Test Procedure, and in steady-state operation from cold start at 20°, 70°, and 100°F ambients. The results from the Federal Test Procedure and steady-state operation showed improvements in fuel economy with the synthetic and graphite-containing lubricants on the order of 1 to 6% when compared to a common base 10W40 lubricant. The order of magnitude varied with the ambient temperature and test vehicle.

25859 (DOE/BETC/IC—80/3(Vol.4), pp 8p, Paper 22) **Emissions characteristics of light-duty diesel vehicles.** Naman, T.M.; Marshall, W.F.; Seizinger, D.E. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

This project deals with emissions from current production light-duty diesel vehicles, with the primary emphasis on particulate emissions. Vehicles are tested on a chassis dynamometer to produce samples which are subsequently analyzed to yield information on the chemical, physical, and biological properties of diesel exhaust products. The vehicles are tested over ranges in ambient temperature, over various duty cycles, and with fuels varying in composition in order to obtain data on the emissions consequences of diesels in the US fleet. This is an ongoing effort in which a data base has been established, and the results of each year's effort are added to the data base.

25860 (DOE/BETC/IC—80/3(Vol.4), pp 9p, Paper 26) **Performance evaluation of a stratified-charge engine powered automobile.** Wares, R.N. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

An experimental study was conducted to assess the performance of an advanced technology White Engines, Inc., stratified-charge engine installed in a late-model vehicle. Chassis dynamometer tests were made to determine the influences of fuel characteristics and ambient temperature on fuel economy. The fuels used were: a regular unleaded gasoline, a low octane oil shale-derived gasoline, and a gasoline diesel blend representative of a broadcut fuel. Alcohol fuels were also used in limited experiments. The vehicle was tested at temperatures of 20°, 50°, 75°, and 100°F using the Federal Test Procedure and the highway fuel economy test. Vehicle economy was virtually unchanged by fuel differences. Ambient temperature was found to have a significant effect on fuel economy, while emissions, except for unburned hydrocarbons, displayed minimal temperature sensitivity.

25861 (DOE/BETC/IC—80/3(Vol.4), pp 3p, Paper 28) **Operation of medium-speed diesel engines on blends of middle distillate SRCII with No. 2D oil.** Martin, F.J. (General Electric Corporate Research and Development Center, Schenectady, NY); Comly, J.B.; Hoffman, J.G. 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

The General Electric Company is carrying out for DOE-BETC, a laboratory and engine testing program whose objectives are: (1) to enable technical appraisal of the potential adaptability and overall suitability of the G.E. FDL type four-stroke diesel engine for use with coal-derived liquid (CDL) type fuels; and (2) to reveal critical problems to be addressed in further development of a CDL/diesel system or a diesel system utilizing comparable minimally processed fuel. The program includes bench-scale laboratory work, fuel screening tests in a two-cylinder engine, and 100-hour tests in an eight-cylinder engine.

25862 (DOE/NASA/0008—12) Ceramic regenerator systems development program. Final report. Fucinari, C.A.; Rahnke, C.J.; Rao, V.D.N.; Vallance, J.K. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center; Ford Motor Co., Dearborn, MI (USA). Research Staff). Oct 1980. Contract AI01-76CS31037. 263p. (NASA-CR—165139). NTIS, PC A12/MF A01. Order Number DE81023765.

This is the final report for the NASA/Ford Ceramic Regenerator Systems Development Program. It describes all of the results obtained in this program, which started October 1, 1976 and was completed December 31, 1979. Tasks within this program included: core durability testing at 800°C [1472°F]; core durability testing at 1000°C [1832°F]; material screening tests; aerothermodynamic performance; design studies of advanced regenerator systems; ceramic thermal stability tests; manufacturing cost studies; and core material and design specifications. Technical progress in each task is reported. Approximately 77,296 core h of engine durability test at 800°C [1472°7] were completed under this program. Turbine engine durability tests on aluminum silicate (AS) regenerator cores show that this material is relatively impervious to chemical attack. Fourteen cores of this material have each accumulated over 5000 h of engine test at 800°C [1472°F], and five cores have each attained the durability objective of 10,000 h with a minimal amount of chemical attack damage. Little problem has been encountered with the elastomer which bonds the ring gear to the regenerator matrix for thick-wall AS or magnesium aluminum silicate (MAS) assemblies. The elastomer cut from an assembly after 7000 h of engine test, shows little sign of aging. Twelve different regenerators have been tested at 1000°C [1832°F] and this sample has accumulated 28,834 h at this temperature. AS and MAS cores showed good mechanical integrity and no signs of chemical nor thermal distress after operation at this temperature. It was concluded that MAS matrix materials provide the best resistance to chemical attack in the engine environment for the regenerator application. (LCL)

25863 (DOE/NASA/0144—81/1) Support services for the automotive-gas-turbine project. Golec, T. (ed.). (Chrysler Corp., Detroit, MI (USA)). Apr 1981. Contract AI01-77CS51040. 148p. NTIS, PC A07/MF A01.

Seven delivery orders were carried out in the area of gas turbine exhibits and vehicle demonstrations. These were to support DOE and NASA in their efforts to inform industry, the public, and Government on the benefits and purpose of the gas turbine programs. Three delivery orders were carried out which involved limited testing to evaluate components, also under the task of providing information which demonstrates the potential of the gas turbine engine. Data were generated on air bearing rotor shaft dynamics, heavy duty variable sheave rubber V-belts, high temperature elastomer regenerator drive mounting and graphite regenerator seal friction characteristics. Nine delivery orders were carried out for maintenance, repair, and retrofit of the experimental gas turbine engines being used by NASA in their gas turbine technology programs and in program demonstrations. Spare parts were procured and/or provided as necessary. Prints and parts lists of engine design updates and microfilms were delivered to the program. Two delivery orders were carried out in meeting the report requirements.

25864 (DOE/NASA/51040—26) Effects of fuel-injector design on ultra-lean combustion performance. Anderson, D.N. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. Contract AI01-77CS51040. 14p. (NASA-TM—82624; CONF-810812—17). NTIS, PC A02/MF A01. Order Number DE81024945.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Emissions data were obtained for six fuel-injector configurations tested with ultra-lean combustion at an inlet-air temperature of 1200 K, a pressure of 250 kPa, and a reference (inlet) velocity of 32 m/s. Fuel injectors included three multiple-source designs and three configurations using a single air-assist injector. Only the multiple-source fuel injectors provided acceptable emissions. Values below the program goals of 16 g CO/kg fuel, 1.9 g HC/kg fuel, and 1.9 g NO_2/kg fuel were obtained for the combustion temperature range of 1450 to 1700 K for both a high blockage (41.1% open area) 42-source injector. The study thus showed that high fuel-injector pressure drop may not be required to achieve low-emissions performance at high inlet-air temperatures when the fuel is well-dispersed in the airstream. Further evaluation of both single-source and multiple-source fuel injection systems is required.

25865 (DOE/NASA/51040—28) Overview: DOE/NASA automotive gas turbine and Stirling projects. Beremand, D.G. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. Contract AI01-77CS51040. 16p. (NASA-TM—82637; CONF-810672—4). NTIS, PC A02/MF A01. Order Number DE81023796.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

A brief overview is presented of the automotive gas turbine and automotive Stirling engine technology projects being carried out by NASA Lewis Research Center for the Department of Energy's Automotive Technology Development Division. This report: (1) discusses the projects as they were formulated and being carried out in accordance with PL 95-238 Auto Propulsion Research and Development Act of 1978; (2) presents substantive technology accomplishments; and (3) briefly addresses future path options of the program.

25866 (PB—81-105819) Baseline fuel economy and emissions tests of a Chrysler 1978, 225 CID engine. Final report. Gagne, G.; Bell, M.; Walter, R. (Department of Transportation, Cambridge, MA (USA). Transportation Systems Center). Sep 1980. 46p. NTIS, PC A03/MF A01.

This document reports on baseline engine tests of a Chrysler 1978, 225 CID, six-cylinder engine. The tests were conducted in the Automotive Research Laboratory at the Transportation Systems Center. Test results presented herein are also filed on computer-based tapes (9-track ASC II).

25867 (PB—81-109555) Support for the analytical tools for automotive fuel economy activities. Final report 30 Nov 77-1 Jul 80. Hatch, W.E. (Automated Sciences Group, Inc., Silver Spring, MD (USA)). Jun 1980. Contract DOT-HS-7-01708. 78p. NTIS, PC A05/MF A01.

Vehicle certification reports are issued by EPA in September (preliminary) and February (final) of each year. These reports contain individual emissions test results. The reports also contain vehicle test weight, engine displacement, dynamometer horsepower setting and fuel economy as computed from the emissions values. The certification data have been extracted on magnetic tape.

25868 (PB—81-109761) Inspection, maintenance and repair of motor vehicles. Subject bibliography. Flynn, L. (National Highway Traffic Safety Administration, Washington, DC (USA). Technical Services Div.). Aug 1980. 303p. NTIS, PC A14/MF A01.

This bibliography represents literature concerning the inspection, maintenance and repair of motor vehicles which has been acquired since the establishment of the National Highway Traffic Safety Administration in 1967. Citations follow the format used in the monthly abstract journal Highway Safety Literature and are indexed by a key-word-out-of-context (KWOC) listing, author, corporate author, contract number, and report number.

25869 (PB—81-114720) Spark discharge characteristics of vehicles energized by ac electric fields. Reilly, J.P. (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). Oct 1980. 52p. NTIS, PC A04/MF A01.

This study examined certain characteristics of spark discharges from vehicles energized by an electric field. Vehicles were placed in an electric field produced by a 500-kV transmission line. Spark discharges were delivered through a resistor to a driven ground rod. Discharge current and voltage were monitored. These data are analyzed to determine capacitance measured under transient spark conditions and are compared with capacitance determined from 60 Hz measurements. The importance of the vehicle tires is examined. Spark discharge waveforms were also studied using standard high voltage capacitors for comparison with those discharge waveforms obtained from measurements on the vehicles. The influence of the impedance of the earth return is discussed with reference to differences between waveforms from the vehicles and the laboratory capacitors.

25870 (PB—81-115081) Testing support for evaluation of inspection/maintenance issues. (Test Group No. 1). Technical report. Ashby, H.A. (Hamilton Test Systems, Inc., Phoenix, AZ (USA)). 1979. Contract EPA-68-03-2829. 68p. NTIS, PC A04/MF A01.

Fifty-one (51) privately owned in-use vehicles equipped with three-way catalyst emission control systems were recruited and tested. The tests conducted on each of these vehicles included an idle test at a DEQ test station, followed by an idle test, FTP, HFET, F3M, and a two mode test at the HTS facility. A diagnostic check was performed on each vehicle prior to being pre-conditioned for the FTP. Any vehicle which was equipped with an air pump was also subjected to a repeat of the HTS idle test and the two mode test with the air pump disconnected. Restorative maintenance was performed on any vehicle which failed to meet EPA-specified emission criteria.

25871 (PB—81-115099) Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 2 and 5). Technical report. Ashby, H.A. (Hamilton Test Systems, Inc., Phoenix, AZ (USA)). 1979. Contract EPA-68-03-2829. 27p. NTIS, PC A03/MF A01.

The tests were performed to determine the effectiveness of the State's mandatory inspection and maintenance program. The effectiveness was to be determined by measuring the exhaust emissions of over 600 vehicles after inspection and maintenance and thereafter quarterly for a one-year period. Not all of the vehicles completed the full sequence of quarterly retests and therefore, as a continuation of that effort, this test group was established. Fifty quarterly retests were performed on twenty-two vehicles. Each retest included an Idle Test, FTP, and HFET at the HTS facility. A diagnostic check was performed on each vehicle prior to being preconditioned for the FTP. Thirty four vehicles with suspected EGR System malperformance were recruited for Test Group No. 5.

25872 (PB—81-115107) Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 3, 4 and 7). Technical report. Ashby, H.A. (Hamilton Test Systems, Inc., Phoenix, AZ (USA)). 1979. Contract EPA-68-03-2829. 186p. NTIS, PC A09/MF A01.

The tests were performed to gather vehicle emissions data to evaluate deterioration effects of exhaust emissions over short periods of time. The deterioration effects were determined by measuring the exhaust emissions after inspection and maintenance, measuring the exhaust emissions after a specific time interval, and comparing the results of the two test sequences. The time intervals selected were one month, two months, and three months. To assist in determining the cause of deterioration, vehicles that exhibited significant deterioration in exhaust emissions were adjusted to manufacturers specifications, tested and then retested after one month. The intention of Test Group No. 7 was to evaluate the effects of mechanic training on emission reductions achieved by motor vehicle inspection and maintenance (I/M) programs.

25873 (PB—81-118630) Technical feasibility of the proposed 1982-1983 high altitude standards for light duty vehicles and light duty trucks. Technical report. Bruetsch, R.I.; McFadden, J.J.; Pidgeon, W.M. (Environmental Protection Agency, Ann Arbor, MI (USA)). Aug 1980. 106p. NTIS, PC A06/MF A01.

Proposed high altitude standards for the 1982 and 1983 model years (MY) were published on January 24, 1980. These standards are for light duty vehicles (LDVs) and light duty trucks (LDTs). This document presents an evaluation of the technical feasibility of the proposed high altitude standards.

25874 (PB—81-119166) Physical and chemical phenomena responsible for odor formation in diesel engines. Interim progress report Jul 78-Dec 79. Cernansky, N.P.; Savery, C.W.; Suffet, I.H.; Cohen, R.S. (Drexel Univ., Philadelphia, PA (USA). Dept. of Mechanical Engineering and Mechanics). Jan 1980. 68p. NTIS, PC A04/MF A01.

Two single cylinder diesel engine test facilities have been modified and instrumented for studying odor formation and control: a CFR prechamber (IDI) engine and a TACOM direct injection (DI) engine. A direct injection head and a 'Comet' type prechamber head for the CFR engine were obtained. Three laboratory burners were designed and built for this study: an air aspirated spray burner; a prevaporized burner; and a prevaporized, premixed, preignition flow reactor. Odor sampling and analysis techniques and procedures were developed and are being refined. Parametric odor studies of the engine and burner systems are underway. More than 990 odor samples have been collected and analyzed. Studies show that differences in peak pattern and intensity are observable with changes in odor level, fuel type, and experimental facility. Steady-state odor mapping indicates that the DI engine had higher odor emissions than the IDI engine in the current experiments. Changes in operating variables (speed, load, injection angle, etc.) over their normal operating ranges did not significantly affect odor emissions.

3302 External Combustion Engines

REFER ALSO TO CITATION(S) 25865

25875 (DOE/NASA/0226—1) Computer simulation of the transient response of a 4 cylinder Stirling engine with burner and air preheater in a vehicle. Martini, W.R. (Martini Engineering, Richland, WA (USA)). Mar 1981. Contract AI01-77CS51040. 183p. (NASA/CR—165262). NTIS, PC A09/MF A01.

A series of computer programs are presented with full documentation which simulate the transient behavior of a modern 4 cylinder Siemens arrangement Stirling engine with burner and air preheater. Cold start, cranking, idling, acceleration through 3 gear changes and steady speed operation are simulated. Sample results and complete operating instructions are given. A full source code listing of all programs are included. Reasonable results are obtained but the program has not been validated.

25876 (DOE/NASA/51040—25) System safety in Stirling engine development. Bankaitis, H. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. Contract AI01-77CS51040. 30p. (NASA-TM—82615; CONF-810721—1). NTIS, PC A03/MF A01.

From 5. international system safety conference; Denver, CO, USA (26 Jul 1981).

The Department of Energy has established a number of broad programs aimed at reducing highway fuel consumption. One of the programs addresses the Stirling engine propulsion system as a possible alternative to the conventional spark-ignition engine. The objective of this program is the development, by 1984, of a Stirling engine system having at least 30% improvement in fuel economy (mpg) over production vehicles powered by conventional spark-ignition engines of the same weight and performance, based on equal BTU content of fuel used. The DOE/NASA Stirling Engine Project Office has required that contractors make safety considerations an integral part of all phases of the Stirling engine development program. As an integral part of each engine design subtask, analyses are being evolved to determine possible modes of failure. The accepted system safety analysis techniques (Fault Tree, FMEA, Hazards Analysis, etc.) are being applied in various degrees of extent at the system, subsystem and component levels. The primary objectives are to identify critical failure areas, to enable removal of susceptibility to such failures or their effects from the system and to minimize risk.

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 25584, 25670, 25882

25877 (AD-A—090113) Baseline tests of the Electra Van Model 1000 electric vehicle. Test report 20 Sep-28 Nov 78. Dowgiallo, E.J. Jr; Snellings, I.R.; Blake, W.H.; Krause, K.F. (Army Mobility Equipment Research and Development Command, Fort Belvoir, VA (USA)). Jul 1980. Contract DOE-EC-77-A-31-1042. 67p. NTIS, PC A04/MF A01.

The Electra Van Model 1000, an electric half-ton multipurpose van, was tested at MERADCOM as part of a Department of

Energy project to characterize the state-of-the-art of electric vehicles. The Electra Van is manufactured in Austin, Texas by Jet Industries, Inc. It is powered by 24, 6-volt batteries that are connected to the motor through an SCR controller actuated by a foot pedal to control motor speed. The 28-horsepower motor drives the rear wheels through a three-speed manual transmission. No regenerative braking is provided.

25878 **(CONF-800939—2) Progress and forecast in electric-vehicle batteries.** Webster, W.H. Jr.; Yao, N.P. (USDOE Assistant Secretary for Conservation and Solar Energy, Washington, DC. Office of Advanced Conservation Technologies; Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023833.

From International congress on transportation; Dearborn, MI, USA (15 Sep 1980).

With impetus provided by US Public Law 94-413 (Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976), the Department of Energy (DOE) launched a major battery development program early in 1978 for near-term electric vehicles. The program's overall objective is to develop commercially viable batteries for commuter vehicles (with an urban driving range of 100 miles) and for vans and trucks (with a range of 50 miles) by the mid-1980's. Three near-term battery candidates are receiving major developmental emphasis - improved lead-acid, nickel/iron and nickel/zinc systems. Sharing the cost with the government, nine industrial firms (battery developers) are participating in the DOE battery project. They are Eltra Corp., Exide Management and Technology Co., and Globe-Union Inc., for the lead-acid battery; Eagle-Picher Industries, Inc., and Westinghouse Electric Corp. for the nickel/iron battery; and Energy Research Corp., Exide Management and Technology Co., and Gould Inc., for the nickel/zinc battery. Good progress has been made in improving the specific energy, specific power, and manufacturing processes of these three battery technologies. Current emphasis is directed toward reduction of manufacturing cost and enhancement of battery cycle life and reliability. Recently, the zinc-chloride battery was added as the fourth candidate to the near-term battery list. Testing of the zinc-chloride battery in a vehicle and evaluation of its operating characteristics are currently under way. This paper presents the development goals, the status, and the outlook for the near-term battery program.

25879 **(CONF-801242—7) Projection of US transportation needs for beyond 1990: a market for advanced vehicles.** Bernard, M.J. III. (Argonne National Lab., IL (USA)). 8 Dec 1980. Contract W-31-109-ENG-38. 18p. NTIS, PC A02/MF A01. Order Number DE81023820.

From Electric and hybrid vehicle advanced technology seminar; Pasadena, CA, USA (8 Dec 1980).

The transportation milieu in which advanced vehicles (AV), principally electric-powered vehicles, will have to compete for a market share in the US is discussed, and forecasts of the AV market to the year 2000 are made considering petroleum supplies, electric power demand, economics, and environmental impacts. It is concluded that there are markets for AVs under certain scenarios of the future, but the competition in the market place from gasoline-like synthetic fuels; alcohol fuels; new technology, such as engines and telecommunications; and different ways of operating the transportation system, e.g. ridesharing, will be substantial. The internal combustion engined vehicle will continue to be improved significantly in terms of energy consumption if liquid fuels remain an issue. Therefore, the conventional vehicle will remain a barrier to the introduction of any new technology. The barrier is simple economics, purchase cost and life-cycle cost. Advanced vehicle innovators will not only have to demonstrate technological feasibility but economic superiority in a market filled with the products of other innovators including those with a mature technology, the ICE. Utilities should have sufficient capacity for two or more decades to handle offpeak charging of EHVs but acid rain from coal power plant emissions will remain a major environmental problem, which can only raise the cost of electricity and thus AV operation. All this will tax the creativity of the AV innovator.

25880 **(DOE/CE—0011/14) Electric and hybrid vehicle program. Quarterly report, January-February-March 1981.** (Department of Energy, Washington, DC (USA). Office of Transportation Programs). May 1981. 18p. NTIS, PC A02/MF A01. Order Number DE81023784.

Highlights of program developments are discussed, and ETV-1 test results are described. The temperature effects on lead-acid battery performance from 27 to 55°C are reported, and the status of demonstration electric vehicle orders and deliveries is summarized. The certification and testing status of demonstration project vehicles is outlined, and a personnel directory for the DOE Electric and Hybrid Vehicle Program is included. (WHK)

25881 **(UCRL—85902) Future possibilities for energy-storage automobiles.** O'Connell, L.G. (Lawrence Livermore National Lab., CA (USA)). 23 Apr 1981. Contract W-7405-ENG-48. 20p. (CONF-810814—1). NTIS, PC A02/MF A01.

From 91. national meeting of the American Institute of Chemical Engineers; Detroit, MI, USA (16 Aug 1981).

Because of the potential threat of a future petroleum shortage, there is increased interest in developing alternative propulsion systems for automobiles, systems that will allow the nation to reduce its demand for petroleum by this part of the transportation sector. A four-year study which assessed the future of energy storage devices for use in automobile propulsion systems has been completed. Results of the energy storage device evaluation are presented. This includes projections of future device characteristics. In addition, the results of the propulsion system analysis are given. Future energy storage automobiles were conceptually designed and they are compared to each other and the baseline internal combustion engine vehicle for several levels of performance.

3304 Hybrid Systems

REFER ALSO TO CITATION(S) 25879, 25880, 25881

25882 **(DOE/CS/51213—T6) NTEV flywheel bearing integrity test.** (AiResearch Mfg. Co., Torrance, CA (USA)). 22 Oct 1979. Contract AC03-76CS551213. 18p. NTIS, PC A02/MF A01.

Procedures for testing the performance of bearings to be used with vehicular flywheels are described. The objective of these tests is to subject the system to simulated operating conditions for a duration long enough to determine wear patterns and temperature characteristics such as bearing skidding, resilient mount motion, bearing separator wear, seal integrity, temperature stabilization levels, duration required for temperature stabilization, changes in losses (coastdown) as a function of operating time, oil consumption, and generation of contamination. The test data obtained will provide operating confidence in the new assembly prior to installation in the car. (LCL)

3305 Flywheel Propulsion

25883 **(Y/DX—290) Composite flywheel balance experience.** Steele, R.S. (Oak Ridge Y-12 Plant, TN (USA)). 6 Apr 1981. Contract W-7405-ENG-26. 9p. (CONF-810812—2). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

High performance composite flywheels possess very attractive properties useful in reducing the total energy requirements for automobiles. Accomplishing this requires high rotational speeds and solution to the accompanying problems of fatigue and vibration control through balancing of the rotor. Recent testing experience with a number of different composite flywheel designs has demonstrated that composite flywheels, as currently fabricated, will require significant balancing and thus expense, to meet the minimum balance requirements practiced in industry. The experience has also demonstrated the disturbing fact that all flywheels tested experienced balance changes with speed changes. This latter discovery means that it will be difficult to maintain a good balance over the full range of operation.

3306 Vehicle Design Factors

REFER ALSO TO CITATION(S) 25882

3307 Emission Control

REFER ALSO TO CITATION(S) 25852, 25853, 25856, 25859, 25860, 25864, 25866, 25867, 25870, 25871, 25872, 25873, 25874, 25885, 25887, 25889, 25890

25884 **(PB—81-103350) The effects on measured emissions of a modified FTP (Federal Test Procedure) driving cycle. Technical report.** Barth, A.E. (Environmental Protection Agency, Ann Arbor, MI (USA)). Nov 1977. 21p. NTIS, PC A02/MF A01.

EPA has been testing vehicles for many years using the Federal Test Procedure (FTP). However, localized control strategies or specific problems often require data that is not normally generated using the standard FTP. To meet these needs, specific test programs are undertaken to answer the questions raised. One recent program extensively investigated the effects of vehicle soak temperatures on emissions. To complement this effort, a short test series was undertaken to quantify the probable emission effects of a modified driving cycle and the results are the subject of this report. Specifically, this test program was designed to determine the effects of delaying vehicle warm-up. This was accomplished by substituting slow speed start-stop driving for the higher speeds normally used at the start of the standard driving cycle.

3308 Alternative Fuels

REFER ALSO TO CITATION(S) 25054, 25197, 25851, 25860, 25861

25885 (DOE/BETC/IC—80/3(Vol.4), pp 13p, Paper 16) **Gasohol: laboratory and fleet test evaluation.** Gurney, M.D. (Dept. of Energy, Bartlesville, OK); Allsup, J.R.; Merlotti, C.L. 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

An experimental program was conducted as a cooperative effort between the Southwestern Bell Telephone Company and the Department of Energy's Bartlesville (Okla.) Energy Technology Center to determine the effects of a gasohol fuel when compared to a control gasoline. The test vehicles used in this program were separated into two groups - a test fleet and a control fleet. The vehicles consisted of several vans, trucks, and automobiles routinely used in commercial service. The laboratory analysis included testing the vehicles on a controlled environmental chassis dynamometer at a constant ambient temperature of 75°F. Field measurements and data collection included road driveability, in-use fuel economy, and fuel system failures. Laboratory analysis provided information on exhaust emissions, fuel economy, and trace metals in the crankcase lubricating oils. The effect of varying the chassis dynamometer inertia weight was also examined. A reduction in regulated exhaust emissions was found with gasohol, but there was considerable variation among the vehicles. No difference was detected in vehicle fuel economy at actual load weights. Unregulated emissions were higher for gasohol, but the absolute levels were low. The fuel economy with gasohol relative to gasoline was improved as the vehicle weight was increased. A larger quantity of copper was found in the crankcase lubricating oil of the vehicles operating on gasohol when compared to the vehicles operating on gasoline. Driveability was poorer with gasohol, especially during the winter and summer seasons.

25886 (DOE/BETC/IC—80/3(Vol.4), pp 8p, Paper 20) **Exhaust and evaporative emissions from alcohol and ether blends.** Naman, T.M.; Allsup, J.R. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

An experimental study was conducted at the US Dept. of Energy's Bartlesville (Okla.) Energy Technology Center to evaluate the effects of four potential fuel extenders (each blended with gasoline) on fuel economy, exhaust emissions, and evaporative emissions from eight 1978 automobiles (three with California emission controls and five with Federal emission control systems). The gasoline/fuel extender blends were: 90% gasoline/10% ethanol, 90% gasoline/10% methanol, 93% gasoline/7% methyl tertiary butyl ether, and 93% gasoline/7% tertiary butyl alcohol. In general, fuel economy decreased from 2.7 to 7.6% with each blend when compared to the base fuel (Indolene). Carbon monoxide emissions were reduced by 8 to 46%. Unburned hydrocarbon emissions were reduced by 5 to 32%, and oxides of nitrogen were either unaffected or increased depending on the fuel extender and the type of emission controls used. Evaporative emissions were generally increased - with the greatest increase (93%) observed with methanol and the lowest increase (5%) shown with tertiary butyl alcohol.

25887 (DOE/BETC/IC—80/3(Vol.4), pp 9p, Paper 21) **Exhaust and evaporative emissions from gasohol-type fuels.** Naman, T.M.; Allsup, J.R. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

An experimental study was conducted at the US Department of Energy's Bartlesville (Okla.) Energy Technology Center in cooperation with the Environmental Protection Agency to determine the characteristics of gasohol-type fuels with respect to exhaust and evaporative emissions. Five fuels, two gasolines (reference and commercial unleaded) and three gasohols (90% gasoline/10% ethanol) were tested in a fleet of ten late-model automobiles. Six were equipped with oxidation catalysts and four were equipped with three-way catalysts. The results obtained from the 1978 Federal test procedure indicate that the addition of ethanol to the base gasoline, whether it is a reference fuel (Indolene) or a commercial fuel, has measurable effects on exhaust and evaporative emissions. However, on the average, the magnitude of these effects was generally within the 1978 emission standards established by the Environmental Protection Agency. More specifically, the addition of ethanol, in the case of vehicles with oxidation catalysts, decreased hydrocarbons by an average of 27%, decreased carbon monoxide by 43%, decreased volumetric fuel economy by 3 pct, and increased oxides of nitrogen by 16%. Evaporative emissions were increased by 40%. In the case of vehicles with three-way catalysts, the addition of ethanol to the base fuel, on the average, decreased carbon monoxide by 7%, decreased fuel economy by 5%, increased hydrocarbons by 12%, increased oxides of nitrogen by 7%, and increased evaporative emissions by 49%.

25888 (DOE/BETC/IC—80/3(Vol.4), pp 5p, Paper 23) **Alternative fuels data bank.** Stamper, K.R. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

To aid researchers working in the area of alternative transportation fuels, the Bartlesville Energy Technology Center (BETC) has established an Alternative Fuels Data Bank as a primary source of technical information. Although the Alternative Fuels Data Bank contains some historical information and some information about other aspects of alternative fuels, it has been designed primarily to reflect the current state-of-the-art of the utilization of alternative transportation fuels. The emphasis is on utilization characteristics of liquid fuels produced from non-petroleum sources. Information related to the utilization of alternative fuels in engine test programs and vehicle fleet studies is receiving the most attention at present. Comprehensive coverage of the utilization of alcohol fuels is now provided, and limited coverage is provided on ethers, hydrogen, emulsions, and synthetic fuels from shale, coal and biomass. The Alternative Fuels Data Bank (AFDB) is a computerized system open to the research community at no cost. Users who have computer terminals with acoustical couplers that operate at 300 baud rate can link with the date bank by telephone and receive an immediate computer printout of the requested information. Users who do not have such terminals can access the information by relaying their request directly to AFDB personnel at the Bartlesville Energy Technology Center; a printout containing the requested information will be mailed.

25889 (DOE/BETC/IC—80/3(Vol.4), pp 18p, Paper 24) **Evaporative emissions from vehicles operating on methanol/gasoline blends.** Stamper, K.R. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

A series of evaporative emission tests was conducted to determine the influence of the addition of methanol to gasoline and length of service on evaporative emissions from light-duty vehicles. Results from these tests show that using a 10% methanol/90% gasoline blend increases evaporative emissions by 130% for short-term use and 220% for long-term use relative to the evaporative emissions produced using a reference gasoline. The evaporative hydrocarbon emissions produced when the vehicles were operating on the methanol blend had a slightly higher photochemical reactivity than those produced from the reference gasoline.

25890 (DOE/BETC/IC—80/3(Vol.4), pp 18p, Paper 25) **Fleet trials using methanol/gasoline blends.** Stamper, K.R. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

Seven current-production automobiles were used in a fleet study to determine the long-term effects and end-use influences of using 10% methanol/90% gasoline blends as automotive fuels. The vehicles were operated over a course designed to accumulate mileage at a rate and duty cycle similar to automobiles used by the private sector in the US. Vehicle tests were run at each 5000-mile accumulation interval to determine the fuel economy and the mass of pollutant emissions generated by the vehicles operating on the 10% methanol blend and to establish a basis for comparison on an unleaded, low-octane Indolene. These data showed an average reduction in volumetric fuel economy (approximately 5%) and a consistent reduction in carbon monoxide emissions associated with the use of the 10% methanol blend. At the end of 50,000 miles of operation on the blend, the engine and fuel handling systems in four of the vehicles were disassembled for inspection and rating to identify any significant wear or materials incompatibility problems associated with long-term operation on the methanol blend. Crankcase lubricants were changed at 5000-mile intervals. Subsequent analyses of the used lubricants did not reveal any significant abnormalities that would indicate an adverse fuel/lubricant interaction. Two of the vehicles were used in Sealed Housing for Evaporative Determination tests using low-octane Indolene and a 10% methanol/90% Indolene blend. The data from these tests showed a significant increase in evaporative emissions associated with short-term use of the methanol blends and an even greater increase when the methanol blend is used for extended periods.

25891 (DOE/BETC/IC—80/3(Vol.4), pp 3p, Paper 29) **Composition and octane number of US motor gasolines sampled in the Du Pont 1979 summer road octane survey.** Johnson, W.L. (E.I. du Pont de Numours and Co., Inc., Wilmington, DE). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 1980.

Samples of US Motor Gasoline obtained from service stations in early June 1979 were composited by region based on company market shares. These composited samples were analyzed for hydrocarbon composition, sulfur, other specifications (distillation, RVP, gum, gravity) and Research and Motor Octane Number.

25892 **(DOE/RA/50366—T1) Feasibility study: utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamas County, Oregon.** (EMCON Associates, San Jose, CA (USA); Cal Recovery Systems, Inc., Richmond, CA (USA); Gas Recovery Systems, Inc., Pasadena, CA (USA)). Jan 1981. Contract FG01-80RA50366. 206p. NTIS, PC A10/MF A01.

In 1978, a landfill operator in Oregon became interested in the technical and economic feasibility of recovering the methane generated in the landfill for the refueling of vehicles. DOE awarded a grant for a site-specific feasibility study of this concept. This study investigated the expected methane yield and the development of a conceptual gas-gathering system; gas processing, compressing, and storage systems; and methane-fueled vehicle systems. Cost estimates were made for each area of study. The results of the study are presented. Reasoning that gasoline prices will continue to rise and that approximately 18,000 vehicles in the US have been converted to operate on methane, a project is proposed to use this landfill as a demonstration site to produce and process methane and to fuel a fleet (50 to 400) vehicles with the gas produced in order to obtain performance and economic data on the systems used from gas collection through vehicle operation. (LCL)

25893 **Performance of a CFR engine burning simulated anaerobic digester's gas.** Neyeloff, S. (Univ. of Connecticut, Storrs); Gunkel, W.W. *ASAE Publication ;* No. 4-81, 324-329(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Anticipating the use of biogas as a fuel for internal combustion (IC) engines, this study was conducted to determine (a) the optimal compression ratio for an engine operating on methane, (b) the effects of carbon dioxide dilution of methane on the performance of said engine and (c) the effects of carbon dioxide dilution on the limits of flammability of methane as the IC engine fuel. Results show that the optimal compression ratio for the biogas operated engine lies between 13:1 and 16:1. A ratio of 15:1 is recommended. The results also show a marked decrease in engine efficiency as carbon dioxide dilution is increased and that the range of flammability of the gas also decreases with an increase in dilution.

25894 **Highway fuel economy of gasohol and unleaded gasoline.** Kaufman, K.R.; Klosterman, H.J.; Walter, J.R. (North Dakota State Univ., Fargo). *ASAE Publication ;* No. 4-81, 397-399(1981). (CONF-8009144—(Vol.2)).

From ASAE national energy symposium; Kansas City, MO, USA (29 Sep 1980).

Tests were conducted using two 1976 Ford Torinos in which the fuel economy using gasohol was compared with that obtained while using unleaded gasoline. Observations were made for both summer and winter driving conditions on North Dakota highways. Gasohol gave 3.4 percent fewer kilometers per liter than the unleaded gasoline. This difference was statistically significant at the 99 percent level of confidence. The reduced fuel economy with gasohol appears to be directly proportional to the lower energy content of gasohol. Vehicle fuel economy during winter driving exhibited a slight temperature dependence while using gasohol. No temperature dependence was detected for gasoline mileage during winter driving conditions or for either fuel during summer driving conditions.

36 MATERIALS

REFER ALSO TO CITATION(S) 25677

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 25178, 25243, 25244, 25384, 25384, 25385, 25385, 25484, 25488, 25522, 25761, 25796, 26010, 26044, 26608, 26618

25895 **(CONF-801124—50) Pulsed laser mixing of Ni-Au surface films on nickel substrates.** Pronko, P.P.; Wiedersich, H.; Seshan, K.; Helling, A.L.; Lograsso, T.A.; Baldo, P.M. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 10p. NTIS, PC A02/MF A01. Order Number DE81023823.

From 3. annual meeting of the Materials Research Society; Boston, MA, USA (17 Nov 1980).

The melt phase alloying of Ni-Au films on Ni substrates has been studied for rapid quenches following 35 nanosecond Q switched ruby laser pulses (0.69 μ wavelength) in the energy regime of 0.5 to 3.0 j/cm^2. The Ni and Au films were each 200 A in thickness having been deposited on a polished Ni substrate by standard hot ribbon vapor deposition methods. Data was obtained on pre and post alloyed surface layers using Rutherford backscattering (RBS) transmission electron microscopy, and STEM energy dispersive x-ray analysis. The melting and resolidification dynamics of the liquid-solid interface was monitored through finite difference

integration of the nonlinear heat conduction equation to give temperature profiles, depth of melting and melt front velocities associated with the liquid-solid phase change. Resolidificaton velocities were typically 20 meters/second with melt depths extending to a few thousand angstroms depending on pulse energy. RBS data confirms that liquid phase diffusion of gold in nickel has occurred. TEM analysis reveals the presence of a two-phase mixture being composed of nickel rich and gold rich material. Microbeam energy dispersive x-ray anaysis indicates the presence of a relatively uniform mixing of these two phases. Pronounced one dimensional solute segregation was not observed in these specimens; however, overall penetration depths of the gold was somewhat larger for the lower energy densities than for the larger ones. Also, unusual circular cell patterns were observed in the resolidified material, their contrast being enhanced by preferential etching during the TEM specimen polishing procedure. 5 figures.

25896 **(CONF-801134—15) Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements.** Cashion, J.D.; Shenoy, G.K.; Niarchos, D.; Viccaro, P.J.; Aldred, A.T.; Falco, C.M. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01. Order Number DE81023804.

From 26. annual conference on magnetism and magnetic metals; Dallas, TX, USA (11 Nov 1980).

Members of the $R_2Fe_3Si_5$ series become either superconducting or magnetically ordered depending on whether the metal atom R (= rare earth, Y or Sc) is diamagnetic or paramagnetic respectively. Moessbauer effect and magnetization measurements were made to determine the magnetic state of the iron and the nature of the superconducting electrons. ^{57}Fe Moessbauer measurements on the Sc, Dy and Er compounds all showed two partially resolved, quadrupole split spectra at all temperatures from 300 to 1.5°K, indicating that there is no resolvable magnetic interaction at the iron site. No major change in the spectrum of $Dy_2Fe_3Si_5$ was observed in passing through its antiferromagnetic ordering temperature of ~ 4°K. Measurements in an applied field of 5.6 T set an upper limit of 0.03 μ/sub B/ for the iron moment in $Sc_2Fe_3Si_5$. However, measurements at 4.2°K in fields up to 7 T for the Dy compound gave an internal field ~ 9% smaller than the applied field and linear with applied field. This corresponds to an induced moment at the iron site of ~ 0.07 μ/sub B/ at 7 T applied field. The ^{161}Dy Moessbauer resonance clearly showed the onset of magnetic order around 4°K and the magnetic moment on Dy at 1.5°K was found to be 7.0 +- 0.2 μ/sub B/ consistent with the magnetization measurements. The nature of the superconducting electrons in the $R_2Fe_3Si_5$ series is discussed in the light of available measurements.

25897 **(CONF-801134—16) Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ under extermal magnetic fields.** Chein, C.L.; Hsu, J.H.; Viccaro, P.J.; Dunlap, B.D.; Shenoy, G.K.; Chen, H.S. (Argonne National Lab., IL (USA); Johns Hopkins Univ., Baltimore, MD (USA); Bell Labs., Murray Hill, NJ (USA)). 1980. Contract W-31-109-ENG-38. 5p. NTIS, PC A02/MF A01. Order Number DE81023801.

From 26. annual conference on magnetism and magnetic metals; Dallas, TX, USA (11 Nov 1980).

^{57}Fe Moessbauer spectroscopy under external magnetic fields of up to 72 kOe has been used to study the magnetic ordering in amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ ($0.25 < x < 1$) at 4.2°K. From the behavior of the magnetic hyperfine fields one concludes that the Fe-rich samples are soft ferromagnets and the Mn-rich samples exhibit spin glass-like properties. In the samples with intermediate Fe concentrations, a magnetic ordering where both ferromagnetic and spin glass-like orderings coexists.

25898 **(CONF-801148—6) Deformation microstructures and mechanical equations of state.** Turner, A.P.L.; Hasegawa, T. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 30p. NTIS, PC A03/MF A01. Order Number DE81023839.

From ASTM conference on mechanical testing for deformation model development; Bal Harbour, FL, USA (12 Nov 1980).

Results of experiments involving various monotonic and cyclic deformation paths and annealing treatments are described. The results show that a state variable theory for constitutive behavior must be based on several independent parameters. Correlations which show that different mechanical responses may depend on the same state variables are discussed. TEM characterizations of the microstructures developed during the tests are reported. Some correlations between microstructure and mechanical behavior are shown, but other cases are reported where no correlation can be found.

25899 **(CONF-810625—18) Progress in understanding the mechanical behavior of pressure-vessel materials at elevated temperatures.** Swindeman, R.W.; Brinkman, C.R. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 19p. NTIS, PC A02/MF A01. Order Number DE81024128.

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

Progress during the 1970's on the production of high-temperature mechanical properties data for pressure vessel materials was reviewed. The direction of the research was toward satisfying new data requirements to implement advances in high-temperature inelastic design methods. To meet these needs, servo-controlled testing machines and high-resolution extensometry were developed to gain more information on the essential behavioral features of high-temperature alloys. The similarities and differences in the mechanical response of various pressure vessel materials were identified. High-temperature pressure vessel materials that have received the most attention included Type 304 stainless steel, Type 316 stainless steel, 2 1/4 Cr-1 Mo steel, alloy 800H, and Hastelloy X.

25900 **(CONF-8006130—3) Introduction to hydrogen in alloys.** Westlake, D.G. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 33p. NTIS, PC A03/MF A01.

From Advanced study institute on metal hydrides; Rhodes, Greece (17 Jun 1980).

Substitutional alloys, both those that form hydrides and those that do not, are discussed, but with more emphasis on the former than the latter. This overview includes the following closely related subjects: (1) the significant effects of substitutional solutes on the pressure-composition-temperature (PCT) equilibria of metal-hydrogen systems, (2) the changes in thermodynamic properties resulting from differences in atom size and from modifications of electronic structure, (3) attractive and repulsive interactions between H and solute atoms and the effects of such interactions on the pressure dependent solubility for H, (4) H trapping in alloys of Group V metals and its effect on the terminal solubility for H (TSH), (5) some other mechanisms invoked to explain the enhancement (due to alloying) of the (TSH) in Group V metals, and (6) H-impurity complexes in alloys of the metals Ni, Co, and Fe. Some results showing that an enhanced TSH may ameliorate the resistance of a metal to hydrogen embrittlement are presented.

25901 **(DOE/ER—0045/6) Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981.** (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 242p. NTIS, PC A11/MF A01. Order Number DE81025775.

This report is organized along topical lines in parallel to a Program Plan of the same title so that activities and accomplishments may be followed readily relative to that Program Plan. Thus, the work of a given laboratory may appear throughout the report. Chapters 1, 2, 8, and 9 review activities on analysis and evaluation, test methods development, status of irradiation experiments, and corrosion testing and hydrogen permeation studies, respectively. These activities relate to each of the alloy development paths. Chapters 3, 4, 5, 6, and 7 present the ongoing work on each alloy development path. The Table of Contents is annotated for the convenience of the reader.

25902 **(DOE/ER—0048/1) Special Purpose Materials annual progress report, October 1, 1979.** (Department of Energy, Washington, DC (USA). Office of Fusion Energy). Apr 1980. 106p. NTIS, PC A06/MF A01. Order Number DE81025979.

The scope of Special Purpose Materials covers fusion reactor materials problems other than the first-wall and blanket struc-

tural materials, which are under the purview of the ADIP, DAFS, and PMI task groups. Components that are considered as special purpose materials include breeding materials, coolants, neutron multipliers, barriers for tritium control, materials for compression and OH coils and waveguides, graphite and SiC, heat-sink materials, ceramics, and materials for high-field (> 10-T) superconducting magnets. It is recognized that there will be numerous materials problems that will arise during the design and construction of large magnetic-fusion energy devices such as the Engineering Test Facility (ETF) and Demonstration Reactor (DEMO). Most of these problems will be specific to a particular design or project and are the responsibility of the project, not the Materials and Radiation Effects Branch. Consequently, the Task Group on Special Purpose Materials has limited its concern to crucial and generic materials problems that must be resolved if magnetic-fusion devices are to succeed. Important areas specifically excluded include low-field (8-T) superconductors, fuels for hybrids, and materials for inertial-confinement devices. These areas may be added in the future when funding permits.

25903 **(EGG-M—01981) Surface finish effects on the high-cycle fatigue of Alloy 718.** Korth, G.E. (Idaho National Engineering Lab., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 35p. (CONF-810591—1). NTIS, PC A03/MF A01. Order Number DE81024591.

From Meeting on the effects of residual stresses on fatigue; Phoenix, AZ, USA (11 May 1981).

Load control high-cycle fatigue tests at 427 and 649°C were conducted on Alloy 718 specimens given various surface finishes. The standard surface preparation for fatigue specimens involves a low-stress grind to minimize the residual surface stresses. A low-stress grind surface was used for generating baseline data; various other surfaces that could be considered feasible for large components fabricated in commercial shops were produced on test specimens, and the high-cycle fatigue strength of each was compared. Surface finishes produced by belt sanding, grit blasting, fine machining, and electropolishing were examined. Surface roughness measurements were taken on typical specimens with each surface finish, and residual stress profiles were measured on three of the surface types. Results show little or no difference in fatigue life for the various surfaces and indicate that residual stress profile and grain size are more important factors than surface roughness in determining high-cycle fatigue strength. 12 figures, 5 tables.

25904 **(HEDL-SA—2137) Rhenium muffle tube fabricated by CVD for application in 1800°C high thermal efficiency fuel processing furnace.** Bowen, W.W. (Hanford Engineering Development Lab., Richland, WA (USA)). Apr 1980. Contract AC14-76FF02170. 20p. (CONF-800439—14). NTIS, PC A02/MF A01. Order Number DE81025303.

From International conference on metallurgical coatings; San Diego, CA, USA (21 Apr 1980).

Portions of this document are illegible.

A CVD rhenium muffle tube has been successfully developed and fabricated for use in a high efficiency fuel processing furnace for nuclear fuels. This is the largest CVD rhenium structure fabricated.

25905 **(IS—4762) Preparation of high-purity silicon using thermite reactions. Final report, October 1, 1979-November 30, 1980.** Schmidt, F.A.; Rehbein, D.K. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 106p. NTIS, PC A06/MF A01. Order Number DE81023616.

The preparation of silicon by metallothermic reduction of sodium fluosilicate (Na_2SiF_6) and silicon tetrafluoride (SiF_4) using magnesium and sodium was evaluated. Reduction of Na_2SiF_6 with magnesium gave a product containing 35 to 42 wt % magnesium. The impurities from the Na_2SiF_6 were found to concentrate in the silicon alloy produced. Reduction with sodium yielded finely divided silicon in a salt matrix. The reduction of SiF_4 produced by the thermal dissociation of Na_2SiF_6 was then investigated. With magnesium as reductant, no thermal booster was required but the product was again a silicon-magnesium alloy. Five kilograms of silicon from the reduction of SiF_4 and subsequent arc casting were sent to ARCO Solar, Inc. for evaluation as a starting material for solar cell fabrication. A small quantity of silicon comparable in purity to that produced from the silane process was also prepared by the sodium reduction of SiF_4. A preliminary cost analysis of producing 225 kg of silicon per day by the metallothermic reduction of SiF_4 with sodium was also prepared.

25906 **(IS-M—315) Remaining fatigue lifetime prediction for retirement-for-cause in aluminum alloys.** Morris, W.L.; James, M.R.; Buck, O. (Rockwell International Corp., Thousand Oaks, CA (USA). Science Center; Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 13p. (CONF-8010190—1). NTIS, PC A02/MF A01. Order Number DE81023756.

From Symposium on NDE; Pittsburgh, PA, USA (5 Oct 1980).

A methodology to predict the probability of specimen failure with subsequent fatigue, after a short surface crack has been detected in an Al 2219-T851 alloy is evaluated. Cracks are detected and tracked to failure using optical microscopy. Predictions of the distribution in remaining lifetimes, for comparison with measured values, are made with a Monte Carlo procedure in conjunction with crack growth laws that model the effect of grains of differing size, shape and crystallograhic orientation on the propagation rate. A slower average rate of crack growth for cracks formed later during fatigue is observed and predicted.

25907 **(IS-M—319) Thermodynamics and phase equilibria in the binary systems of vanadium with IV B elements.** Smith, J.F. (Ames Lab., IA (USA)). 1981. Contract W-7405-ENG-82. 14p. (CONF-810203—14). NTIS, PC A02/MF A01. Order Number DE81023790.

From 110. annual meeting of the AIME; Chicago, IL, USA (22 Feb 1981).

A survey of available data for binary vanadium systems with Group IV B elements shows that the number of intermediate phases tends to decrease with increasing atomic number of the IV B element. Four intermediate phases have been found in the V-Si and V-Ge systems, two in the V-Sn system, and none in the pure V-Pb system at ambient pressure. In three instances out of four, the stoichiometries of the phases in the V-Si system become successively more rich in vanadium as silicon is replaced first by vanadium and then by tin, and phase stability ceases for the two central stoichiometries when tin replaces silicon and for all stoichiometries when lead replaces silicon. This indication of decreasing phase stability with increasing atomic number of the IV B element is confirmed by successively less negative enthalpies of phase formation in the sequence V-Si, V-Ge, and V-Sn.

25908 **W-Re composite tube fabricated by chemical vapor deposition for application in an 1800°C high thermal efficiency fuel-processing furnace.** Svedberg, R.C.; Buckman, R.W. Jr. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.); Bowen, W.W. (Hanford Engineering Development Lab., Richland, WA (USA)). *Thin Solid Films ;* **72**: No. 2, 393-398(1 Oct 1980).

From International conference on metallurgical coatings; San Diego, CA, USA (21 - 25 Apr 1980).

Chemically vapor-deposited rhenium was selected as the muffle material for an 1800°C high thermal efficiency fuel-processing furnace. The muffle is exposed to high vacuum on the heater-insulation-instrumentation side and to a flowing Ar-8vol.%H_2 gas mixture at a pressure of 1 atm on the load volume side. During operation the muffle cycles from room temperature to 1800°C and back to room temperature once every 24h. Its operational life is dependent on its resistance to thermal fatigue during the high temperature exposure. For a prototype furnace the muffle has an inner diameter of approximately 13 cm and is 40 cm in length. A small (about half size) rhenium closed-end tube overcoated with tungsten was used to evaluate the concept. The fabrication and testing of the composite W-Re tube and prototype rhenium muffle are described.

25909 **(PNL-SA—9255) Summary of comparative dual-ion-irradiation experiment on 316 stainless steel.** Brimhall, J.L.; Charlot, L.A. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Dec 1980. Contract AC06-76RL01830. 9p. NTIS, PC A02/MF A01.

Results of the void size, number density and swelling from a dual ion irradiation experiment (5-MeV Ni^+, 500-keV He^+) agree

reasonably well with those from an identical experiment at ANL. There are discrepancies noted at the lowest and highest temperature which indicate that the two experiments were not performed at exactly the same temperatures. Either an upward shift of the ANL temperature or a downward shift of the PNL temperature would help explain these discrepancies. 6 figures.

25910 **(SAND—80-0732) Effect of strain-rate and microstructure on the ductile brittle transition temperature in structural steels: Part I. Literature assessment.** Knorovsky, G.A. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 29p. NTIS, PC A03/MF A01. Order Number DE81025890.

A literature assessment of the effect of strain rate upon the fracture toughness of low and medium strength structural steels is presented which appears to contradict accepted fracture control procedures, in particular that being used by the Federal Highway Administration and the American Association of State Highway and Transportation Officials. An alternative approach at analyzing the collected data, which is based upon an understanding of the strengthening mechanisms acting, is suggested. This approach indicates that not only the strength level, but also the actual transition temperature needs to be considered in predicting the strain-rate sensitivity of the fracture toughness.

25911 **(SAND—80-2800C) Fragment-size prediction in dynamic fragmentation.** Grady, D.E. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 4p. (CONF-810684—6). NTIS, PC A02/MF A01. Order Number DE81023750.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

A general definition of dynamic fragmentation can encompass any impulsive process which partitions a body of material into discrete domains. Included, for example, would be fragmentation due to brittle fraction under impact loading or fragmentation due to shear banding in shock-compression plastic deformation. An energy approach is proposed whereby surface or interface area created in the fragmentation process is governed by an equilibrium balance of the surface or interface energy and a microstructural inertial or kinetic energy term. Relations provided by the analysis compare well with experimental dynamic fracture and shock-wave shear-band results.

25912 **(SAND—80-2847C) Strain-rate effects in beryllium under shock compression.** Asay, J.R.; Chhabildas, L.C.; Wise, J.L. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 5p. (CONF-810684—13). NTIS, PC A02/MF A01. Order Number DE81024080.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Shock wave experiments were conducted on beryllium over the range of 6 to 25 GPa. A steady wave analysis of the shock front was used to estimate effective viscosities achieved during the loading process, which were found to vary approximately as the inverse square root of strain rate for strain rates greater than about 3 μs^{-1}.

25913 **(SAND—80-2864C) Reshock and release behavior of beryllium.** Chhabildas, L.C.; Wise, J.L.; Asay, J.R. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 9p. (CONF-810684—19). NTIS, PC A02/MF A01. Order Number DE81024064.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Reshock and release wave profile measurements in beryllium over the stress region 6 to 35 GPa have indicated no evidence of an hcp-bcc phase transition as previously suspected. The present measurements show that the yield strength of the material is 1.8 GPa at 34 GPa, a substantial increase from the ambient value of 0.3 GPa.

25914 **(SAND—81-0041C) Criterion for thermo-plastic shear instability.** Burns, T.J.; Grady, D.E.; Costin, L.S. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810684—8). NTIS, PC A02/MF A01. Order Number DE81023178.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Dynamic torsional Kolsky (split-Hopkinson) bar experiments on thin-walled tubes of 1018 cold-rolled and 1020 hot-rolled steel are modeled using a deformation plasticity theory which incorporates a specific constitutive model for the shear stress in terms of strain, strain-rate, and temperature into a system of differential equations. The exact time-dependent homogeneous flow solution of the equations is found and used to derive a special case of a generally accepted instability criterion. For given material parameters, this criterion predicts a critical strain at which a homogeneous deformation can bifuricate into a localized deformation, i.e., a shear band, at constant strain-rate. Stability diagrams of strain-rate vs. strain can be constructed for the two types of steel using the criterion. The Kolsky bar data is shown to be consistent with this analysis, and an explanation for the instability criterion is given which assumes that small perturbations on the non-steady homogeneous flow are isentropic to first order.

25915 **(SAND—81-0108C) Thermal-viscous model for heterogeneous yielding in aluminum.** Hayes, D.B.; Grady, D.E. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 10p. (CONF-810684—3). NTIS, PC A02/MF A01. Order Number DE81023748.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

The finite rise times of high intensity shock waves in metals are commonly interpreted in terms of a bulk viscosity which is observed to vary inversely as the square root of the strain rate. To interpret this result, a two-temperature thermal model of a heterogeneously-yielding metal has been constructed. The model assumes that the body is composed of thin shear bands in which irreversible energy is dissipated as heat and which are separated by the bulk of the material which undergoes isentropic compressive heating only. A condition of wave steadiness quantifies the irreversible energy dissipated during the passage of the shock. Two important results follow: first, the dependence of the apparent viscosity on the inverse square root of the strain rate stems from the microstructural, heterogeneous nature of the process, and is only expected for steady waves; second, when the model is used to interpret recent experiments, the viscosity calculated in the shear band itself is seen to be temperature independent.

25916 **(Y/DV—73) Effect of titanium content and aging temperature on the properties of uranium-titanium alloys.** Northcutt, W.G. Jr. (Oak Ridge Y-12 Plant, TN (USA)). 28 Apr 1981. Contract W-7405-ENG-26. 16p. (CONF-801061—7). NTIS, PC A02/MF A01. Order Number DE81024091.

From Conference on high density penetration materials; Charlottesville, VA, USA (28 Oct 1980).

The mechanical properties and microstructures of four uranium-titanium alloys were examined as functions of titanium content and aging temperature. Titanium alloy content was varied from 0.41 to 0.79 weight percent. Aging temperatures from 350 to 450°C (all for six hours) were evaluated for each alloy in addition to tests in the unaged conditions. Titanium and aging temperature were both shown to be strong effects in determining alloy properties. It was determined that the uranium-0.41 weight percent titanium alloy underwent extensive age-hardening even though the alloy did not exhibit a martensitic microstructure characteristic of the alloys richer in titanium.

25917 **(Y/DV—74) Hydrogen content and strain rate effects on the tensile properties of a uranium-titanium alloy.** Northcutt, W.G. Jr.; Powell, G.L.; Myhre, T.C. (Oak Ridge Y-12 Plant, TN (USA)). 28 Apr 1981. Contract W-7405-ENG-26. 10p. (CONF-801061—8). NTIS, PC A02/MF A01. Order Number DE81024092.

From Conference on high density penetration materials; Charlottesville, VA, USA (28 Oct 1980).

The effects of hydrogen content and strain rate on the tensile properties of a uranium-0.74 weight percent titanium (U-0.74Ti) alloy were determined. Hydrogen embrittlement of the U-0.74Ti alloy occurred below 1 wppm H_2 in specimens tested at 10^{-4} s^{-1}. At a higher strain rate of 1 s^{-1}, however, the alloy experienced a much less embrittling effect out to approximately 8 wppm H_2. Hy-

drogen content in the alloy did not affect properties other than elongation and reduction-in-area. Strength properties were increased by the higher strain rate. A second alloy of U-0.74Ti with increased iron content (from 20 to 50 wppM) was also tested at the high strain rate for the effect of hydrogen content on tensile properties. No differences in properties could be detected in the high strain rate results due to iron content.

25918 Isotope effect in niobium self-diffusion. Bussmann, W.; Herzig, C.; Hoff, H.A.; Mundy, J.N. (Institut fuer Metallforschung der Universitaet Muenster Muenster, W. Germany). *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 12, 6216-6222(15 Jun 1981).

Measurements of the isotope effect in niobium self-diffusion have been made over the temperature range 1900 °C to near the melting point (2468 °C). The measurements were made by simultaneous diffusion of ^{95}Nb and ^{92}Nb isotopes from a thin surface layer and subsequent sectioning. The ratio of ^{92}Nb to ^{95}Nb in each section was determined using a well-type Ge(Li) detector of high efficiency. The low values of the measured isotope effect are similar to other bcc metals (Na, α- and δ-Fe, Cr, and β-Zr); however, the temperature dependence is different.

25919 Determination of the threshold-energy surface for copper using in-situ electrical-resistivity measurements in the high-voltage electron microscope. King, W.E.; Merkle, K.L.; Meshii, M. (Department of Materials Science and Engineering, Northwestern University, Evanston, Illinois 60201). *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 12, 6319-6334(15 Jun 1981).

A detailed study of the anisotropy of the threshold energy for Frenkel-pair production in copper was carried out experimentally, using in-situ electrical-resistivity measurements in the high-voltage electron microscope. These electrical-resistivity measurements, which are sensitive to small changes in point-defect concentration, were used to determine the damage or defect production rate. Damage-rate measurements in copper single crystals were carried out for ~40 incident electron-beam directions and six electron energies from 0.4 to 1.1 MeV. The total cross section for Frenkel-pair production is proportional to the measured damage rate and can be theoretically calculated if the form of the threshold-energy surface is known. Trial threshold-energy surfaces were systematically altered until a "best fit" of the calculated to the measured total cross sections for Frenkel-pair production was obtained. The average threshold energy of this surface is 28.5 eV. The minimum threshold energy is 18 +- 2 eV and is located near <100>. A ring of very high threshold energy (>50 eV) surrounds the <111> direction. A damage function for single-defect production was derived from this surface and was applied to defect-production calculations at higher recoil energies. This function rises rather sharply from a value of zero at 17 eV to 0.8 at 42 eV. It has the value of 0.5 at 24.5 eV. Above 30 eV the slope of the curve begins to decrease, reflecting the presence of the high-energy regions of the threshold-energy surface. Both topographical and quantitative comparisons of the present surface with those in the literature were presented. Based on a chi^2 goodness-of-fit test, the present surface was found to predict the experimentally observed total cross sections for Frenkel-pair production significantly better than the other available surfaces. Also, the goodness of fit varied substantially less with energy and direction for the present surface.

25920 Computer simulation study of the displacement threshold-energy surface in Cu. King, W.E.; Benedek, R. (Materials Science Division, Argonne National Laboratory, Argonne, Illinois 60439). W-31-109-ENG-38. *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 12, 6335-6339(15 Jun 1981).

Computer simulations were performed using the molecular-dynamics technique to determine the directional dependence of the threshold energy for production of stable Frenkel pairs in copper. Sharp peaks were observed in the simulated threshold energy surface in between the low-index directions. Threshold energies ranged from ~25 eV for directions near <100> or <110> to 180 eV at the position of the peak between <110> and <111>. The general topographical features of the simulated threshold-energy surface are in good agreement with those determined from an analysis of recent experiments by King et al. on the basis of a Frenkel-pair resistivity rho/sub F/ = 2.85 x 10^{-4} Ω cm. Evidence is presented in favor of this number as opposed to the usually assumed value, rho/sub F/ = 2.00 x 10^{-4} Ω cm. The energy dependence of defect production in a number of directions was investigated to determine the importance of nonproductive events above threshold.

25921 Influence of relativistic contributions to the effective potential on the electronic structure of Pd and Pt. MacDonald, A.H.; Daams, J.M.; Vosko, S.H.; Koelling, D.D. (National Research Council, Ottawa K1A 0R6, Canada). W-31-109-ENG-38. *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 12, 6377-6398(15 Jun 1981).

The influence of relativistic-interaction corrections to the energy density functional in the density functional formalism is examined using explicit calculations for Pd and Pt. We present and compare three separate self-consistent density-functional calculations which included (1) exchange only, (2) exchange and correlation, and (3) exchange and correlation plus relativistic-interaction corrections. Since they are of comparable or larger size, we have included and examined the effects of relativistic kinematics and non-muffin-tin potential shapes. Because the relativistic interaction corrections are significant only very near the nucleus, we report separately results for the core levels and for the valence states. The corrections obtained were negligible for Pd and small but significant for Pt.

25922 Electrical and thermal transport coefficients of pure vanadium. Tsai, C.L.; Fagaly, R.L.; Weinstock, H.; Schmidt, F.A. (Department of Physics, Illinois Institute of Technology, Chicago, Illinois 60616). *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 12, 6430-6440(15 Jun 1981).

The electrical and thermal conductivities of high-purity vanadium samples have been measured over a wide range of low temperatures and analyzed in terms of electron-impurity scattering, electron-electron scattering, and electron-phonon interband and intraband scattering. In the normal state, electron-phonon interband scattering is a major factor over the entire temperature range, with the electron-phonon intraband scattering becoming important above 50 K. At lower temperatures, our results show evidence of electron-electron scattering. The thermal conductivity in the superconducting state was fit by Bardeen-Rickayzen-Tewordt theory, with 2Δ(0)/k/sub B/T/sub c/≅3.386. The deviation of the experimental points from this fit at lower temperatures was used to obtain the lattice conductivity, providing additional information on the phonon-electron interaction and phonon-boundary scattering. The mass-enhancement factor, λ, is also calculated and found to be consistent with those values obtained from specific-heat and tunneling-effect measurements.

25923 Energetics of hydrogen in aluminum. Perrot, F.; Rasolt, M. (Commissariat a l'Energie Atomique, BP27, 94190 Villeneuve-Saint-Georges, France). W-7405-ENG-26. *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 12, 6534-6540(15 Jun 1981).

A detailed account of the results obtained for the energetics of a proton in aluminum is reported. The central model used in the calculations is the so-called "spherical solid model" in which the part of the ionic potential which is spherically symmetric around the impurity is treated to all orders. Various additional effects, such as the contributions of the nonspherical potential and lattice relaxation are investigated. The variation of the heat of solution of H in Al with position is calculated, and the zero-point vibration energy estimated.

25924 Pressure dependence of the Fermi surface of hcp Yb. Schirber, J.E.; Beaudry, B.J.; Jepsen, O. (Sandia National Laboratories, Albuquerque, New Mexico 87185). DE-AC04-76-DP00789. *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 12, 6541-6543(15 Jun 1981).

The pressure dependence of Fermi-surface cross sections for principal symmetry directions has been investigated using solid He pressure generation techniques. Careful searches for de Haas—van Alphen signals were conducted from 2 to 9 kbar in both virgin fcc crystals and samples transformed from hcp to fcc. No sign of the

frequency reported by Ribault was detected. Results are discussed in terms of theoretically calculated pressure-induced changes in the band structure and Fermi surface of the hcp phase of Yb.

25925 Temperature dependence of the Doppler-broadened positron annihilation spectra in single and polycrystalline Cd. Jean, Y.C.; Lynn, K.G.; Goland, A.N. (Physics Department, Brookhaven National Laboratory, Upton, New York 11973). DE-AC02-76CH000/6. *Physical Review [Section] B: Condensed Matter ;* **23**: No. 11, 5719-5724(1 Jun 1981).

The Doppler shifts of annihilation photons have been measured in well-characterized single and polycrystalline samples of Cd as a function of sample temperature between 10 and 540 K by a two-detector Doppler-broadening method which permits separation of core-state and valence-state annihilations. The temperature dependence of the broadening associated with those annihilations involving predominantly low-momentum electrons was found to be dependent on the orientation of the single-crystal sample with respect to the axis of the two detectors. This detected anisotropy at various sample temperatures ($220 < \text{or} = T < \text{or} = 325$ K) is thought to be associated with the asymmetric nature of the positron and electron wave functions, possibly localization of the positron. The variation with crystallographic direction in the low-momentum region occurs both at low temperatures in the so-called prevacancy region and at temperatures where vacancy trapping is observable. The components of the Doppler-broadened spectra that correspond to annihilations with very-high-momentum electrons as might be expected do not show this orientation dependence although they agree with the low-momentum components in implying the existence of a well-defined prevacancy region.

25926 Optical diffraction technique for determination of crystal orientations. Sopori, B.L. (Motorola, Inc., Solar Energy R&D Department, 5005 East McDowell Road, Phoenix, Arizona 85008). AC-01-79ET-23104. *Applied Optics ;* **20**: No. 10, 1758-1763(15 May 1981).

An optical technique for determination of crystal orientations is described. This technique uses texture etching to generate pseudoperiodic surface structures whose groove shape is characteristic of the surface orientation. When such a textured surface is illuminated with monochromatic light, a far-field diffraction pattern characteristic of the surface orientation is observed. A procedure for analysis of diffraction patterns to determine crystal orientations is discussed. Results obtained by this technique agree very well with those using the x-ray Laue technique.

25927 Chemisorption theory: Dissociation of H_2 on Ti(0001). Cremaschi, P.; Whitten, J.L. (Department of Chemistry, State University of New York at Stony Brook, Stony Brook, New York 11794). DE-AC02-77ER04387. *Physical Review Letters ;* **46**: No. 18, 1242-1244(4 May 1981).

The chemisorption of H_2 on Ti(0001) is treated with use of an ab initio configuration-interaction theory for the surface region. Dissociation of H_2 occurs above the surface but more stable threefold coordination sites lie closer to the surface at ~1.3 A. Adsorption in adjacent threefold sites is less stable than in separated sites sharing only one surface atom. Bonding is predominantly with the 4s electrons of the metal leading to hydridic hydrogens and a polarized lattice electronic distribution.

25928 Pulsed laser irradiation of Al. Follstaedt, D.M.; Peercy, P.S.; Wampler, W.R. (Sandia National Laboratories, Albuquerque, New Mexico 87185). DE-ACD4-76. *Physical Review Letters ;* **46**: No. 18, 1250(4 May 1981).

He^+-ion backscatter analysis on laser-irradiated monocrystals of Al shows no evidence of a amorphous layer.

25929 High-resolution spectroscopy of matrix-isolated ReO_4^- molecules. Chraplyvy, A.R.; Moerner, W.E.; Sievers, A.J. (Physics Department, General Motors Research Laboratories, Warren, Michigan 48090). 4-X20-9830N-1. *Optics Letters ;* **6**: No. 5, 254-256(May 1981).

The temperature-dependent linewidth of the saturable infrared active ν_3 vibrational model (10.8 μm) of ReO_4^- molecules in pure-KI host crystals has been measured between 2 and 600 K. Below 20 K the absorption line is inhomogeneously broadened and has a 0.016-cm^{-1} width (FWHM). Above 30 K the transition is homogeneously broadened by elastic acoustic phonon-scattering processes. The low-temperature inhomogeneous width of ReO_4^- molecules in KI:RbI alloys is 2 orders of magnitude larger than for the pure KI crystal, and the absorption is coincident with the 10.8-μm P(42) CO_2 laser line at all temperatures.

25930 Neutron-scattering study of hydrogen diffusion in thorium. Kamitakahara, W.A.; Khatamian, D.; Peterson, D.T. (Ames Lab., IA (USA)); Mook, H.A. (Oak Ridge National Lab., TN (USA)). *Journal of the Less-Common Metals ;* **74**: No. 2, 459(15 Oct 1980).

From International symposium on the properties and applications of metal hydrides; Colorado Springs, CO, USA (7 - 11 Apr 1980).

Published in summary form only.

25931 Comparison of fission fragment damage with fast neutron damage in metals. Averback, R.S.; Birtcher, R.C.; Thompson, L.J. (Argonne National Lab., IL (USA). Materials Science Div.). *Journal of Nuclear Materials ;* **92**: No. 1, 144-146(Aug 1980).

25932 Study on high-temperature corrosion resistance of Zircaloy-4 with spheroidized hydrides. Hamasaki, M. (National Tsing Hua Univ., Hsinchu, Taiwan); Lin, S.C.; Chuang, Y.D. *Ho Tzu K'o Hsueh ;* **17**: No. 1, 1-9(Mar 1980).

The effect of hydriding and spheroidization treatments with different hydrogen concentrations on the corrosion behavior of Zircaloy-4 specimens was studied at 200 to 500°C, 1 atm steam. It was found, at all temperatures, the hydriding treatment decreases the corrosion resistances of the zirconium alloys and the spheroidization treatment recovers the corrosion resistance of the hydrided specimen to certain extent. The recovery is significant in the temperature range 200 to 400°C while at 500°C the recovery is not very effective due to high oxidation rate. The n value of corrosion curve is not sensitive to the heat treatment we applied to the specimen. The corrosion before transition at 200 to 400°C approximately follows cubic law, while at 500°C the specimen breaks away within one day and then follows parabolic law. At 400°C, the specimen breaks away around 27 to 30 days and post transition corrosion is nearly rectilinear.

25933 Field induced magnetic form factor of Zr. Stassis, C.; Kline, G.; Harmon, B.N. (Ames Lab., IA (USA); Iowa State Univ. of Science and Technology, Ames (USA). Dept. of Physics); Moon, R.M.; Koehler, W.C. (Oak Ridge National Lab., TN (USA). Solid State Div.). *Journal of Magnetism and Magnetic Materials ;* **14**: 303-305(1979).

From International conference on neutron scattering and magnetism; Juelich, Germany, F.R. (29 - 31 Aug 1979).

The neutron magnetic form factor obtained with H perpendicular to the c-axis is in good agreement with calculations assuming a 65% band theoretical spin density and a 35% atomic-like orbital density. Measurements with two different field directions showed no evidence of the large anisotropy observed in bulk susceptibility experiments.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 24842, 25645, 25685, 25686, 25760, 25802, 25986, 26613

25934 (ANL/MSD/FE—81-1) Development of nondestructive-evaluation techniques for high-temperature ceramic heat-exchanger components. Semiannual report, October 1980-March 1981. Kupperman, D.S.; Caines, M.J.; Yuhas, D.; Sciammarella, C.; Spevak, L. (Argonne National Lab., IL (USA)). Apr 1981. Contract W-31-109-ENG-38. 45p. NTIS, PC A03/MF A01. Order Number DE81024480.

During this reporting period, progress has been made in the development of the ultrasonic bore-side probe, application of acoustic microscopy techniques to ceramic joint assessment, quantification of holographic interferometry to obtain flaw-size information, and evaluation of rod anode microfocus radiography for ceramic butt joint assessment.

25935 (CONF-800765—10) Observations on grain-boundary structures in nickel oxide. Liou, K.Y.; Peterson, N.L. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01. Order Number DE81023125.

From 7. LLR/MMRD international symposium of interfaces in glass-metal systems; Berkeley, CA, USA (28 Jul 1980).

This paper reports on transmission electron microscopic analysis of dislocation networks at low angle boundaries in nickel oxide annealed (1500°C) to reach equilibrium, and the structure of (001)-twist boundaries near special coincidence angles in nickel oxide bicrystals prepared by a pressure-sintering technique.

25936 Nuclear magnetic resonance studies of hydrogen in TiCrsub(1.8)Hsub(x). Bowman, R.C. Jr. (Monsanto Research Corp., Miamisburg, OH (USA)); Johnson, J.R. (Brookhaven National Lab., Upton, NY (USA)). *Journal of the Less-Common Metals ;* **73**: No. 2, 254(15 Sep 1980).

From International symposium on the properties and applications of metal hydrides; Colorado Springs, CO, USA (7 Apr 1980).

25937 (SAND—80-0019C) Paramagnetic defects in shock-loaded TiO_2. Venturini, E.L.; Morosin, B.; Graham, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 10p. (CONF-810684—9). NTIS, PC A02/MF A01. Order Number DE81023165.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Electron spin resonance (ESR) has been used to characterize the paramagnetic defects in TiO_2 powder samples which have been subjected to explosive loading to enhance catalytic activity and preserved for post-shock study. Two prominent defects are observed in the low temperature ESR powder spectra following peak shock pressures of either 13 or 20 GPa in the copper recovery fixture: an axial defect identified as Ti^{+3} ion, and an isotropic defect tentatively ascribed to an electron trapped at an oxygen vacancy. A series of high temperature isochronal anneals show that both defects are removed rapidly above 670K. Catalytic activity of the shocked TiO_2 powder cycled to such temperatures indicates that the paramagnetic defects are not the source of the enhanced catalysis. A study of the x-ray line broadening shows that the strains and dislocations introduced by shock loading can be removed by annealing above 1100K.

25938 Chemical vapor deposition of TiB_2 from diborane. Pierson, H.O.; Mullendore, A.W. (Sandia Labs., Albuquerque, NM (USA)). *Thin Solid Films ;* **72**: No. 3, 511-516(15 Oct 1980).

From International conference on metallurgical coatings; San Diego, CA, USA (21 - 25 Apr 1980).

An experimental study of the chemical vapor deposition of titanium diboride on graphite is described using the reaction of $TiCl_4$ with B_2H_6 in a hydrogen atmosphere in the temperature range 600-900°C. Dense and adherent coatings were obtained varying in composition from boron rich at 600°C (TiBsub(3.12)) to stoichiometric above 700°C. There was a gradual increase in crystallite size with increasing deposition temperature. Chlorine tended to remain incorporated in the deposit (1.86 at.% at 600°C decreasing to 0.51% at 900°C). The coatings were very hard (HV=3715 kgf mm^{-2}).

25939 Low temperature chemical vapor deposition of TaB_2. Randich, E. (Sandia Labs., Albuquerque, NM (USA)). *Thin Solid Films ;* **72**: No. 3, 517-522(15 Oct 1980).

From International conference on metallurgical coatings; San Diego, CA, USA (21 - 25 Apr 1980).

Crystalline TaB_2 was deposited using the chemical vapor deposition reaction of $TaCl_5$ and B_2H_6 in the temperature range 773-1200 K. Thermodynamic calculations were made which compared the use of both B_2H_6 and BCl_3 as boron source gases. The deposits obtained with B_2H_6 had an extremely small crystal size and contained amorphous boron when the deposition temperature was below approximately 873 K but were substoichiometric in boron above this temperature. Carbon analysis indicated that carbon may be substituting for boron and thereby stabilizing the diboride structure at high deposition temperatures. The microhardness of the coatings decreased with increasing atomic ratio of boron to tantalum and decreasing crystal size.

3604 Polymers And Plastics

REFER ALSO TO CITATION(S) 25018, 25018, 25028, 25473, 25721, 25992

25940 (SAND—80-2836C) Shock compression temperature rise determined from resistivity of embedded metal foils. Bloomquist, D.D.; Sheffield, S.A. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 10p. (CONF-810684—11). NTIS, PC A02/MF A01. Order Number DE81024083.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

The temperature rise induced by shock compression of polymethyl methacrylate (PMMA) was determined from measurements of the electrical resistivity of embedded copper foils. The temperature of the copper was determined from the observed foil resistance and known values of the change in copper resistivity with temperature and shock compression. Temperature values obtained over a stress range from 0.9 to 6.0 GPa are in good agreement with thermocouple measurements reported previously.

25941 (UCRL—53124) Evaluation of organic peroxides as curing agents for methylphenylvinyl-siloxane elastomers used for cellular silicone cushions. Cady, W.E.; Jessop, E.S.; McKinley, B.M.; Buckner, A.T. (Lawrence Livermore National Lab., CA (USA)). 13 Apr 1981. Contract W-7405-ENG-48. 21p. NTIS, PC A02/MF A01. Order Number DE81025121.

Two nonvinyl-specific curing agents, TS50 and BS, and three vinyl-specific curing agents, 101XL, 10XL, and 497XL, in two gums, SE54 and L97KVB, with two temporary fillers, urea and ammonium chloride are evaluated. In both gums, the vinyl-specific catalysts produce a lower compression set than the nonvinyl-specific curing agents. IN SE54 gum, 497XL and 10XL produce a softer cushion than the other catalysts. Also these two catalysts can be used in both gums with urea to produce L3223 cellular silicone. With vinyl-specific catalysts, urea and ammonium chloride produce the same load-deflection results, but urea gives a lower compression set than ammonium chloride. The two gums are quite different: L97KVB produces a much stiffer cushion with much less set than does SE54.

25942 (UCRL—85744) Structure-property relations of Kevlar 49 fibers. Pruneda, C.O.; Steele, W.J.; Kershaw, R.P.; Morgan, R.J. (Lawrence Livermore National Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 10p. (CONF-810813—3). NTIS, PC A02/MF A01.

From National American Chemical Society summer meeting; New York, NY, USA (23 Aug 1981).

The relation between the physical structure and deformation and failure processes of Kevlar fibers is presented. The fiber fabrication processes that affect the critical structural parameters controlling deformation and failure are considered. The deformation and failure processes are discussed in the light of fracture topography studies of epoxy composite strands and non-etched and HCl-etched bare yarns together with deformation studies of bare yarns deformed directly in the optical microscope. A physical model is suggested for Kelvar 49 in which there is an amorphous skin and crystalline core. The core consists of periodic transverse defect planes spaced about 200 nm along the fiber. Chain ends are assumed to cluster within the vicinity of these planes. The non-crystalline skin in which the chain ends are arranged essentially randomly relative to one another does not contain such transverse weak planes.

25943 Influence of Co-60 γ-ray on the stress relaxation of SBS type thermoplastic elastomer. Hsiue, G.H.; Liew, Y.K. (National Tsing Hua Univ., Hsinchu, Taiwan). *Ho Tzu K'o Hsueh ;* **17**: No. 1, 11-18(Mar 1980).

Thermoplastic elastomer (TPR) of SBS type was exposed to Co-60 γ-source with various irradiation doses at room temperature

in air atmosphere and vacuum. The irradiated samples were tested by stress relaxation measurement. It was found that the network structure of TPR irradiated in vacuum was crosslinked by the γ-ray induced reaction, while the sample irradiated in air exhibited unique phenomenon, i.e., the network structure was shown to be degraded in the lower irradiation doses (< 5 Mrad), and TPR was highly crosslinked as the irradiation-dose was raised more than 10 Mrad. Such examples irradiated in air were considered to induce the formation of nonuniform network structure which could be treated by applying the kinetic theory of rubberlike elasticity. This is attributed to those coexistent factors of the oxidative chain scission reaction, the oxidative chain crosslinking reaction and the diffusion of oxygen which were recognized to act as the dominant factors in the formation of such a network structure. By applying the uniform crosslinking effect induced by γ-ray in vacuum, it was proved that the chemical stress relaxation of TPR was initiated by the main chain scission. This paper delineates the application of the γ-ray irradiation method to improve the mechanical properties of TPR by use of the stress relaxation measurement.

3606 Other Materials

REFER ALSO TO CITATION(S) 25133, 25134, 25138, 25264, 25273, 25274, 25274, 25587, 25678, 25679, 25680, 25681, 25682, 25683, 25684, 25687, 25688, 25689, 25749, 25750, 25759, 26083, 26618

25944 (BDX—613-2565) CTBN variability study. Final report. Young, D.A. (Bendix Corp., Kansas City, MO (USA)). May 1981. Contract AC04-76DP00613. 33p. NTIS, PC A03/MF A01. Order Number DE81023773.

The carboxyl-terminated butadiene/acrylonitrile copolymer (CTBN)/epoxy adduct, BKC 20102, which is used for encapsulating electronic devices, was studied to improve its quality and reliability. The average chemical, physical, and mechanical properties were obtained by testing 16 batches of adduct prepared from 13 separate lots of CTBN. Three methods were determined to prepare a clear, soluble liquid adduct that does not separate in storage or transit. Two of these methods also produce a clear epoxy casting and a filled potting compound with improved impact and flexural, compressive, and tensile strengths. Study of the temperature-viscosity profile during the cure of the liquid adduct has shown that a slight change in the degassing time can significantly reduce foaming during degassing.

25945 (CONF-800954—4) High-temperature Moessbauer study of ^{57}Fe interstitials in Chevrel phases. Stafford, B.L.; Karlov, T.F.; Kimball, C.W.; Fradin, F.Y. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01. Order Number DE81023879.

From Ternary superconductors conference; Lake Geneva, WI, USA (24 Sep 1980).

Moessbauer measurements have been made at ^{57}Fe nuclei in the Chevrel phase compound $Fe_{0.05}SnMo_6S_8$ from 300 to 1100K and $Fe_{0.05}HoMo_6S_8$ from 80 to 673K. Iron atoms are found to be in two electronic states which are attributed to Fe monomers and dimers in Cu-II-like crystallographic sites. No evidence of diffusive broadening is observed to 1100K for Fe atoms in the $Fe_{0.05}SnMo_6S_8$ compound. The iron atoms are apparently in deep interstitial traps bound to S and Sn atoms. Thermal cycling experiments indicate that phase decomposition is occurring at temperatures of about 400C for the Ho compound and 800C for the Sn compound.

25946 (GA-A—16001) Effect of couple-stress on the pure bending of a prismatic bar. Tzung, F.; Kao, B.; Ho, F.; Tang, P. (General Atomic Co., San Diego, CA (USA)). Feb 1981. Contract AT03-76ET35300. 10p. (CONF-810801—34). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

An evaluation of the applicability of the couple-stress theory to the stress analysis of graphite structures is performed by solving a pure bending problem. The differences between solutions from the couple-stress theory and from the classical theory of elasticity are compared. It is found that the differences are sufficient to account for the inconsistencies which have often been observed between the classical elasticity theory and actual behavior of graphite under bend and tensile loadings. An experimental procedure to measure the material constants in the couple-stress theory is also suggested. The linear couple-stress theory, the origins of which go back to the turn of the last century, adds linear relations between couple-stresses and rotation gradients to the classical stress-strain law. By adopting the classical assumption that the plane cross section remains plane after deformation, the pure-bending problem is reduced to a plane couple-stress problem with traction-free boundary conditions. A general solution for an isotropic elastic prismatic bar under pure bending is then obtained using the Airy stress function and another stress function wich accounts for the couple-stresss. For a cylindrical bar, it reduces to a simple series solution. The moment-curvature and stress-curvature relations derived for a cylindrical bar from the general solution are used to examine the effect of couple-stresses. Numerical compilation of relations indicates that the couple stress parameters can be practically determined by measuring the moment-curvature ratio of various diametered specimens under bending. Although there is not sufficient data for such evaluation at present, it appears that the theory is consistent with the limited bend and tensile strength data of cylindrical specimens for H-451 graphite.

25947 Magnetic properties of SmN. Moon, R.M.; Koehler, W.C. (Oak Ridge National Lab., TN (USA). Solid State Div.). *Journal of Magnetism and Magnetic Materials ;* **14**: 265-269(1979).

From International conference on neutron scattering and magnetism; Juelich, Germany, F.R. (29 - 31 Aug 1979).

Specific heat results for SmN give clear evidence of magnetic order at 18.2 K. Susceptibility results are less convincing, but indicate an ordering temperature in the range 13-15 K. In neutron diffraction experiments, we have found no evidence of magnetic order at temperatures above 1.6 K. By combining these apparently conflicting results with observations of the low-temperature induced form factor and of the inelastic neutron cross-section, we have been able to deduce values for the crystal-field and exchange parameters which allow a consistent interpretation of all the experimental results. We find that $A_4[r^4] = (251 +- 20)K$, $A_6[r6] = (20 +- 13)$ K, and the exchange interaction is ferromagnetic. For these crystal-field parameters the orbital and spin contributions to the ground-state moment almost cancel exactly, giving a nearly zero ground state moment and a very unusual magnetic form factor. The strong temperature dependence of the induced form factor, expected for Sm^{3+} ions, has been confirmed.

25948 (GA-A—16270) Strength of nonuniformly oxidized PGX graphite. Price, R.J.; Beavan, L.A. (General Atomic Co., San Diego, CA (USA)). May 1981. Contract AT03-76ET35301. 39p. NTIS, PC A03/MF A01. Order Number DE81025224.

Flexural and tensile tests were performed on PGX graphite oxidized to produce a steep surface oxidation gradient. Companion tensile specimens were oxidized under different conditions to produce uniform oxidation throughout the specimen, and their tensile strength and Young's modulus were measured. The flexural strength, flexural elastic modulus, and tensile strength were reduced much less by surface oxidation than by uniform oxidation. The test data were in good agreement with a simple linear elastic model in which Young's modulus at any point is a function of oxidation burnoff, and the strain at failure is independent of oxidation. The unoxidized interior of the specimens appears unaffected by the surface burnoff and remains able to fulfill its load-bearing function. 18 figures, 8 tables.

25949 (LA—8746-MS) Materials for magnetic refrigeration between 2 and 20 K. Barclay, J.A.; Steyert, W.A. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 24p. NTIS, PC A02/MF A01. Order Number DE81024031.

As part of a research and development program on magnetic refrigeration, paramagnetic materials suitable for magnetic refrigeration in the 2 to 20 K range have been studied for the Jet Propulsion Laboratory. The best materials with known properties, as derived from a literature survey, are plotted. For one of those materials, gadolinium gallium garnet, the results are presented of field-dependent heat capacity measurements. Preparation and fabrication of

gadolinium compounds are discussed briefly as well as the scope of further work for selecting and studying working materials for magnetic refrigeration.

25950 **(LA-UR—81-1017) Muon states in the antiferromagnetic oxides α-Fe_2O_3 and $FeTiO_3$.** Boekema, C.; Denison, A.B.; Ruegg, K.J. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 3p. (CONF-810809—1). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

Low temperature results of muon spin rotation studies in α-Fe_2O_3 and $FeTiO_3$ are reported. Through a comparison of the results on these two structural isomorphs, an attempt is made to determine the muon stop site and chemical environment of the muon. Both dipole and covalent contributions to the effective magnetic field at the muon sites are considered. An interpretation of the muon hyperfine interactions in these antiferromagnetic oxides in terms of muon bond formation, analogous to hydrogen bonding, is discussed.

25951 **(LA-UR—81-1044) Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure.** Hambourger, P.D.; Huang, C.Y.; Luo, H.L.; Segall, B. (Los Alamos National Lab., NM (USA); Cleveland State Univ., OH (USA). Dept. of Physics; California Univ., San Diego, La Jolla (USA). Dept. of Electrical Engineering and Computer Sciences; Case Western Reserve Univ., Cleveland, OH (USA). Dept. of Physics). 1981. Contract W-7405-ENG-36. 9p. (CONF-810809—11). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

The Hall coefficient and resistivity of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ have been measured over the range $1.5 < T < 300$ K under hydrostatic pressure up to 5.3 kbar. The data suggest thermally-activated conduction, but in all cases the carrier concentration saturates at $\sim 10^{22}$ holes/cm^3 for $T > 100$ K. A band model is proposed which is qualitatively consistent with the data.

25952 **(SAND—81-1315C) Crystallographic properties of lithium niobate shock-loaded from 3.7 to 20 GPa and preserved for post-shock study.** Morosin, B.; Graham, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810684—16). NTIS, PC A02/MF A01. Order Number DE81023168.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Optical and x-ray diffraction observations are reported for lithium niobate crystals which have been subjected to shock loading along the c axis and recovered for post-shock study. At pressures of 3.5 and 5.5 GPa, no unusual x-ray diffraction results are observed. Optical observations on these samples show planar features similar to prior observations in other crystals. At 9.5 and 19 GPa, the x-ray observations indicate that the samples are recrystallized into micron size crystalites with well coordinated crystallographic alignment changes from the original crystal axis. The observed effects are thought to be initiated by localized heating accompanying heterogeneous yielding.

25953 **(SAND—81-1354C) Shock-induced defects in cadmium sulfide.** Dodson, B.W.; Venturini, E.L. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810684—15). NTIS, PC A02/MF A01. Order Number DE81023167.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

We report on the explosive shock loading of CdS powders pressed to 50% of theoretical density in a copper recovery capsule, to pressures in the copper of about 3, 13, and 20 GPa, and preservation of the samples for post-shock study. No residual structural changes were detected via x-ray diffraction, but large densities ($\sim 10^{16}$/cm^3) of two types of defects were detected using ESR. One defect had an isotropic spectrum, with g = 2.0028, and the other had an axial spectrum with g/sub parallel/ = 1.790 and g/sub perpendicular to/ = 1.775. The axial defect seems to be connected with the wurtzite-rocksalt phase transition in CdS.

25954 **(SERI/TR—8002-6-T1) Investigation of photoelectrochemical corrosion of semiconductors. Final report, 15 April 1980-15 April 1981.** Frese, K.W. Jr.; Loo, B.H.; Morrison, S.R. (Solar Energy Research Inst., Golden, CO (USA); SRI International, Menlo Park, CA (USA)). Apr 1981. Contract AC02-77CH00178. 80p. NTIS, PC A05/MF A01.

The theoretical work focused on the development of a corrosion model to describe the stabilization efficiency, S, of semiconductor electrodes such as GaAs. The equations that were developed relate S to the photocurrent; solid state properties such as capture cross sections, back bond energy levels and density of defect levels; and redox electrolyte properties including capture cross sections and rearrangement energies, λ, of ions in solution. Homogeneous electron transfer rate data were also analyzed to determine the rearrangement energy of individual ions. The experimental work was performed using both single- and poly-crystal n-GaAs and Si as well as single-crystal CdSe. Corrosion measurements on poly-GaAs showed that corrosion is minimal at grain boundaries. RRDE studies of polycrystalline Wacker silicon showed that grain boundaries are effectively corroded by holes. Preliminary RRDE studies of corrosion suppression were done on single-crystal n-GaAs using displacement plated metal layers. The thickness of the gold metal layer varied from sub monolayer amounts to 60 A. At 2 ma/cm^2 photocurrent, the stabilization efficiency was increased by three to four times using [Fe(II) EDTA]/ sup =/ as the reducing agent and other metals. It was shown by a combination of RRDE and ellipsometric studies that the stability of the oxidized silicon electrode was maximal when the oxide layer was $\sim$ 20 A. The silicon photoelectrochemical cell was investigated in methanol/ $LiNO_3$ solutions containing various organic reducing agents. The corrosion was monitored by j-V characteristics. The N,N,N',N'-tetramethyl p- phenylene diamine (TMPD) reducing agent showed the most promising stability characteristics.

25955 **New transitions in the photoluminescence of GaAs quantum wells.** Miller, R.C.; Kleinman, D.A.; Munteanu, O.; Tsang, W.T. (Bell Laboratories, Murray Hill, New Jersey 07974). *Applied Physics Letters ;* **39**: No. 1, 1-3(1 Jul 1981).

When GaAs quantum wells are optically excited with intensities >10 kW/cm^2 new peaks appear in the photoluminescence spectrum at low temperatures. The excitation spectra are used to demonstrate that the new peaks correspond to the recombination of electrons in excited well states, $n>1$, with holes in $n = 1$ states. These parity-forbidden transitions, Δn odd, derive their strength from three body interactions that occur at high excitation levels.

25956 **Epitaxial regrowth of thin amorphous GaAs layers.** Grimaldi, M.G.; Paine, B.M.; Maeenpaeae, M.; Nicolet, M.; Sadana, D.K. (California Institute of Technology, Pasadena, California 91125). *Applied Physics Letters ;* **39**: No. 1, 70-72(1 Jul 1981).

Channeling and transmission electron microscopy have been used to investigate the parameters that govern the crystal quality following capless funace annealing at low temperature ($\sim$ 400 °C) in ion-implanted GaAs. From the results obtained, we concluded that the crystal quality after annealing depends strongly on the thickness of the amorphous layer generated by ion implantation and the number of residual defects increases linearly with the thickness of the implanted layer. Single-crystal regrowth free of defects detectable by megaelectron volt He^+ channeling was achieved for a very thin amorphous layer ($<$ or $\approx$ 400 A).

25957 **Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices.** Wu, I.h.; Hong, M.; Morris, J.W. Jr. (Materials and Molecular Research Division, Lawrence Berkeley Laboratory, Department of Materials Science and Mineral Engineering, University of California, Berkeley, California 94720). W-7405-ENG-48-4051. *Applied Physics Letters ;* **39**: No. 1, 110-112(1 Jul 1981).

Convergent-beam transmission electron diffraction was used to determine the crystallographic orientation of submicron-sized A15 structure V_3Ga and Nb_3Al precipitates formed by solid-state precipitation from supersaturated BCC solutions. In each case the crystallographic orientation relation was (to within an uncertainty of +- 5°): [001]/sub A/15parallel[111]/sub B/CC; (100)/sub A/

15parallel(110)/sub B/CC. This lattice correspondence is intuitively plausible, since it ensures that the closest packed planes and directions of the precipitate parallel to those of the matrix.

25958 **Raman scattering studies of the impurity-induced ferroelectric phase transition in $KTaO_3$:Li.** Prater, R.L.; Chase, L.L.; Boatner, L.A. (Physics Department, Indiana University, Bloomington, Indiana 47405). *Physical Review [Section] B: Condensed Matter ;* **23**: No. 11, 5904-5915(1 Jun 1981).

Raman scattering and optical depolarization measurements have been employed in investigations of the phase transition induced by the substitution of lithium for potassium in $KTaO_3$ to form K/sub 1-x/Li/sub x/TaO_3. Lithium concentrations as high as 5.4 mol % were studied. At low concentration, x< or =0.004, the intensities of the disorder-induced scattering features observed for pure $KTaO_3$ increase as the Li fraction increases. A low-frequency feature, which was previously associated with a Li resonance mode, appears to be scattering from the coupled TA and TO branches due to disorder introduced by the lithium. For x> or ≃0.01, a clearly defined step in the optical depolarization is observed at a temperature T/sub c/ which increases rapidly with lithium concentration and reaches a value of T/sub c/ = 70 K at x = 0.054. The dependence on the polarization direction of the incident light indicates that a tetragonal or orthorhombic low-temperature phase is formed with <100> symmetry axes. New Raman-active phonons are observed near and below T/sub c/. The anisotropy of the energy of the extraordinary phonon expected from polar modes is not observed in the unpoled samples. Poling can be accomplished by cooling the crystals through T/sub c/ with an applied electric field, after which the polar character of these phonons is observed. The lack of anisotropy in unpoled samples is the result of the presence of ferroelectric domains with diameters smaller than optical wavelengths. Additionally, the depolarization measurements imply domain sizes of at least a few thousand A. These results clearly disagree with the previous claims that K/sub 1-x/Li/sub x/TaO_3 is not ferroelectric for x<0.24 and that the Li centers form a polar glass at low temperatures. Finally, the presence of the lithium impurities stiffens the TO branch at the zone center, and the ferroelectric phase results from an order-disorder transition of the off-center lithium ions.

25959 **Magnetic quantum oscillations in tetramethyltetraselenafulvalene-hexafluorophosphate [$(TMTSF)_2PF_6$].** Kwak, J.F.; Schirber, J.E.; Greene, R.L.; Engler, E.M. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review Letters ;* **46**: No. 19, 1296-1299(11 May 1981).

The metallic (high-pressure) phase of $(TMTSF)_2PF_6$ exhibits Shubnikov—de Haas resistance variations at low temperatures. A single frequency of 0.76 MG has been recorded. A large anisotropy in the transverse magnetoresistance is also observed. Our results imply a two-dimensional Fermi surface under pressure, with compensated electron and hole sections oriented along the crystal c axis. Some unusual and physically significant anomalies associated with the oscillations are discussed.

25960 **Normalizing infrared FT photoacoustic spectra of solids.** Riseman, S.M.; Eyring, E.M. (Department of Chemistry, University of Utah, Salt Lake City, Utah 84112). *Spectroscopy Letters ;* **14**: No. 3, 163-185(Mar 1981).

The PAS of 8 different manufactured carbon samples was examined at 3 different scanning speeds. (AIP)

25961 **ESR in CVD silicon and silicon-carbon alloys.** Gaczi, P.J. (Univ. of Chicago, IL); Booth, D.C. Contract ER-78-S-02-4899. *Solar Energy Materials ;* **4**: No. 3, 279-289(Mar 1981).

Electron spin resonance (ESR) in three groups of chemical vapor deposited (CVD) silicon films is reported. Group I films are amorphous Si/sub x/C/sub 100-x/ alloys prepared from silane and acetylene at a substrate temperature T/sub s/ = 630°C and have a spin density N/sub s/ ≃ 3 x 10^{19} cm^{-3}. These silicon-carbon films have been developed as structurally stable selective absorbers for photothermal solar energy conversion. Group II films are nonalloyed amorphous silicon films prepared below T/sub s/ = 660°C with N/sub s/ ≃ 1 x 10^{19} cm^{-3}, while group III films are polycrystalline silicon prepared above T/sub s/ = 670°C with N/sub s/ ≃ 0.5 x 10^{19} cm^{-3}. The exchange interaction between spins is sufficiently strong in the silicon-carbon alloys (group I) so that an average g value is observed and no evidence of superposition is found in agreement with the amorphous Si-Ge results of Kumeda et al. ESR saturation and line broadening as a function of microwave power in samples representative of the three groups was observed. In the order group III, II, I, we find a trend of increasing spin system homogeneity, indicating that the exchange coupled spin clusters contain increasing numbers of spins.

25962 **Magnetization density in paramagnetic UGe_3.** Lander, G.H.; Reddy, J.F. (Argonne National Lab., IL (USA)); Delapalme, A. (Laboratoire Leon Brillouin, Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)); Brown, P.J. (Institut Max von Laue - Paul Langevin, 38 - Grenoble (France)). *Journal of Magnetism and Magnetic Materials ;* **14**: 295-297(1979).

From International conference on neutron scattering and magnetism; Juelich, Germany, F.R. (29 - 31 Aug 1979).

We have measured the magnetization density in the actinide intermetallic compound UGe_3 (cubic $AuCu_3$ structure). The induced moment at 4.2 K with H (applied) = 48 kOe is 0.012 μsub(B)/mol. The most significant result is that a small positive moment of approximately 0.0018 μsub(B) is induced at and near the Ge site, which is unusual because elemental Ge is diamagnetic. The spin density at the Ge site is highly aspherical, showing the nature of the bonding with the uranium wave functions.

25963 **Neutron diffraction study of USbsub(1-x)Tesub(x) solid solutions.** Burlet, P.; Quezel, S.; Rossat-Mignod, J. (CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France)); Lander, G.H. (Argonne National Lab., IL (USA)); Vogt, O. (Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Festkoerperphysik). *Journal of Magnetism and Magnetic Materials ;* **14**: 309-311(1979).

From International conference on neutron scattering and magnetism; Juelich, Germany, F.R. (29 - 31 Aug 1979).

The antiferromagnetic structure (type I) of USb is strongly modified by the substitution of Sb by Te (UTe is a ferromagnet). At sub(N) a sine wave modulation with a longitudinal polarization along [100] is observed. At Tsub(IC) approximately equal to 165 K, a first-order transition towards a commensurate state occurs. Below about 100 K, for x = 0.12 and 0.15, a new incommensurate modulation is found in addition to the type IA (k = 1/2) component.

40 CHEMISTRY

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 24866, 24883, 24887, 24903, 24909, 24914, 24914, 24922, 24964, 25090, 25091, 25174, 25196, 25232, 25567, 25797, 25982, 26134, 26134, 26168, 26169, 26722

25964 **(CONF-810647—6) Determination of ultratrace concentrations of uranium and thorium in natural waters by x-ray fluorescence.** Stewart, J.H. Jr.; Brooksbank, R.D. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01. Order Number DE81023230.

From Conference on X- and gamma-ray sources and applications; Ann Arbor, MI, USA (10 Jun 1981).

An x-ray fluorescence method for the simultaneous determination of uranium and thorium at the less than 1 ppM level in natural waters is described. Uranium and thorium are coprecipitated with an internal standard, yttrium, and incorporated into an iron-aluminum hydroxide carrier. The hydroxide precipitate is filtered, and the filter disk is analyzed by the energy-dispersive x-ray fluorescence technique. Matrix interferences caused by the presence of unpredictable anions and cations are compensated for by the internal standard. The U/Y and Th/Y ratios are linear over the 5- to 100-μg range of interest, and the detection limit of each element on the filter disk is 2 μg (3 σ). Relative standard deviation was 17% at the 15-μg and 4% at the 100-μg level for thorium and 11% at the 11-μg and 2% at the 100-μg level for uranium. Analysis of spiked solutions showed a recovery of 19.6 +- 0.3 μg for uranium and

19.8 +- 0.3 μg for thorium at the 20-μg level, and the normal lower reporting limit is 5 μg. Fifty disks can be routinely measured during a normal working day.

25965 (CONF-810682—3) Determination of uranium and thorium in semiconductor memory materials by high fluence neutron activation analysis. Dyer, F.F.; Emery, J.F.; Northcutt, K.J.; Scott, R.M. (Oak Ridge National Lab., TN (USA); International Business Machines Corp., Hopewell Junction, NY (USA). East Fishkill Lab.). 1981. Contract W-7405-ENG-26. 19p. NTIS, PC A02/MF A01. Order Number DE81023064.

From 6. international conference: Modern trends in activation analysis; Toronto, Canada (15 Jun 1981).

Uranium and thorium were measured by absolute neutron activation analysis in high-purity materials used to manufacture semiconductor memories. The main thrust of the study concerned aluminum and aluminum alloys used as sources for thin film preparation, evaporated metal films, and samples from the Czochralski silicon crystal process. Average levels of U and Th were found for the source alloys to be ~ 65 and ~ 45 ppB, respectively. Levels of U and Th in silicon samples fell in the range of a few parts per trillion. Evaporated metal films contained about 1 ppB U and Th, but there is some question about these results due to the possibility of contamination.

25966 (DOE/EV/10403—2) Identification of noise in linear data sets by factor analysis. Roscoe, B.A.; Hopke, P.K. (Illinois Univ., Urbana (USA). Dept. of Nuclear Engineering). 1981. Contract AC02-80EV10403. 12p. (CONF-810682—5). NTIS, PC A02/MF A01. Order Number DE81025042.

From 6. international conference: Modern trends in activation analysis; Toronto, Canada (15 Jun 1981).

The approach to classical factor analysis described in this paper, i.e. doing the analysis for varying numbers of factors without prior assumptions to the number of factors, prevents one from getting eroneous results by inherent computer code assumptions. Identification of a factor containing most of the variance of one variable with little variance of other variables, pinpoints a possible difficulty in the data, if the singularity has no obvious physical significance. Examination of the factor scores will determine whether the problem is isolated to a few samples or over all the samples. Having this information, one may then go back to the raw data and take the appropriate corrective action. Classical factor analysis has the ability to identify several types of errors in data after it has been generated. It is then ideally suited for scanning large data sets. The ease of the identification technique makes it a beneficial tool to use before reduction and analysis of large data sets and should, in the long run, save time and effort.

25967 (DOE/EV/10403—3) Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials. Daly, A.T. (Illinois Univ., Urbana (USA)). 1981. Contract AC02-80EV10403. 38p. NTIS, PC A03/MF A01. Order Number DE81025041.

Thesis.

In this work, several US Geological Survey (U.S.G.S.) and National Bureau of Standards (N.B.S.) reference samples have been analyzed in an effort to improve the quality of elemental concentration data available on these materials, so they can be used in a program of verification of factor analysis source resolution procedures. The analyses of these samples were performed by instrumental neutron activation analysis (INAA). The samples analyzed were: U.S.G.S. Green River Shale, N.B.S. 45b Homogeneous River Sediment, U.S.G.S. Analyzed Peridotite N.B.S. 1579 Powdered Lead-based Paint, U.S.G.S. Hawaian Basalt U.S.G.S. Marine Mud, U.S.G.S. Analyzed Cody Shale U.S.G.S. Glass Mountain Rhyolite, N.B.S. Argillaceous Limestone No. 1, and a sample of Spex ultrapure graphite. Neutron activation analysis was employed because of the high sensitivity that can be attained in determining elemental concentrations. Although INAA is a relatively simple method and the reproducibility of the data is good, the method shows some inaccuracies. The basic theory and technique are reviewed in an attempt to show where problems can arise and how they can be dealt with.

25968 (DOE/PC/30041—T2) Development and application of analytical techniques to chemistry of donor solvent liquefaction. Quarterly progress report, April 1980-June 1980. Dorn, H.C.; Taylor, L.T. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). Oct 1980. Contract AC22-80PC30041. 21p. NTIS, PC A02/MF A01.

In this report we focus on our continuing efforts to develop new fluorine reagents useful for characterizing heteroatom (e.g., O, N and S) containing organic compounds present in coal and/or other fuel fractions. Although the utility of trifluoroacetyl chloride and trifluorodiazoethane as fluorine tagging reagents for studies of this type have been previously discussed, we describe further techniques utilizing these reagents which are under present study. It should be mentioned that the advantage of the fluorine tagging approach is the high sensitivity of the ^{19}F nuclide to NMR detection and the high sensitivity of the ^{19}F chemical shift parameter to subtle changes in molecular structure. Recently, workers at Exxon have reported the use of a silicon tagging reagent utilizing ^{29}Si NMR to characterize various heteroatom containing organic moieties present in fuel samples. Silicon containing reagents have some of the same advantages as fluorine reagents. Namely the low levels of either fluorine or silicon in most samples of interest avoid obvious spectral background problems associated with hydrogen or carbon tagging reagents. Furthermore, like ^{19}F, ^{29}Si chemical shifts would be expected to be sensitive to subtle changes in molecular structure, however ^{29}Si suffers from low NMR sensitivity.

25969 (MLM—2840(OP)) Gamma-ray measurements for simultaneous calorimetric assay. Rakel, D.A. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 6p. NTIS, PC A02/MF A01. Order Number DE81024317.

Portions of document are illegible.

By combining the measurements obtained by calorimetry and gamma-ray spectroscopy, calorimetric assay provides a nondestructive method for determining the plutonium content of a sample. Simultaneous calorimetric assay refers to a system in which both of these measurements are performed at the same time. This paper reports the results of gamma-ray measurements performed in developing the Simultaneous Calorimetric Assay System. The transmission of gamma rays through the calorimeter was measured over the energy region germane to a determination of plutonium isotopic composition. For six different samples, a gamma-ray measurement of isotopic composition was obtained with the sample in the calorimeter. The items represented a range of plutonium content (19-231 g) and isotopic composition. The effective specific power was calculated from the isotopic composition determined by gamma-ray measurements. The uncertainty in the effective specific power indicates, for the items measured in this study, and as measured in this study, the uncertainty in the total plutonium content of the sample expected in simultaneous calorimetric assay.

25970 (ORNL/TM—7760) Strontium-90 determinations by Cerenkov radiation counting for well monitoring at Oak Ridge National Laboratory. Larsen, I.L. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 24p. NTIS, PC A02/MF A01. Order Number DE81025853.

A rapid method for determination of ^{90}Sr (28.8 y half-life) via its daughter ^{90}Y (64.1 h half-life) in aqueous samples from the solid low-level radioactive waste disposal areas at the Oak Ridge National Laboratory (ORNL) utilized the principle of direct Cerenkov radiation counting. This technique is applicable for beta particles exhibiting maximum energies greater than 0.42 pJ (263 keV) in aqueous solution. In the presence of other contributing energetic beta emitters the technique may serve as a useful screening method to distinguish low activity samples from more moderate or higher activity concentrations. A comparison between analysis of ^{90}Sr by Cerenkov radiation counting and by standard wet chemical separation techniques indicated a high degree of correlation and excellent agreement. The detection limit for a 20-mL sample under the prescribed experimental conditions and a counting interval of 20 min was approximately 0.2 dpm/mL (0.1 pCi/mL).

25971 (SAND—81-0156C) Simultaneous determination of antimony and chlorine in synthetic rubbers by 14-MeV neutron-activation analysis. Bild, R.W. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 14p. (CONF-810682—1). NTIS, PC A02/MF A01. Order Number DE81023304.

From 6. international conference: Modern trends in activation analysis; Toronto, Canada (15 Jun 1981).

A nondestructive method for the analysis of Sb and Cl in synthetic rubbers by 14 MeV neutron activation analysis has been developed and evaluated by comparisons with microanalytical and thermal neutron activation analysis results. The method is most precise when a rubber with known amounts of Sb and Cl is used as a standard. Samples containing 0.07 to 2.5 wt % Sb and 2.5 to 15.9 wt % Cl have been analyzed and precision for the method is 10% or better. Antimony and Cl detection limits are 0.02 and 0.5 wt % respectively. Agreement among the three methods is excellent; the thermal activation analysis method is more precise and simpler to apply if only Sb needs to be determined in a sample.

25972 Reverse phase liquid chromatography of coal liquefaction solvents. Burke, F.P.; Winschel, R.A.; Pochapsky, T.C. (Conoco Coal Development Co., Library, PA). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 68-76(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Results are presented on the reverse phase liquid chromatography (RPLC) separation of Wilsonville SRC-I solvents. These data are quantified and the relative amounts of the eluted fractions provide an explanation of the relative values of these solvents as liquefaction media. Results are also presented on the RPLC separation of H-Coal recycle distillates. It was found that, for the RPLC elution program used, a strong linear correlation exists between the retention time of the component and a structural vector consisting of ten parameters which describe that component's molecular structure. This allows one to predict the retention time of a component of interest for qualitative identification, and can also be used to support the identification of a component observed to elute at a given retention time. Reverse phase liquid chromatography is a promising method for analytical or preparative separation of coal derived distillates. The high resolution and selectivity of commercially available ODS columns allow specific component classes (e.g., polars, aromatics, saturates) to be separated without cross contamination. A wide variety of elution programs is readily available. The inertness of the column substrate should minimize problems of irreversible adsorption and chemical alteration of sample components on the column. The rather unexpected result that retention time can be accurately predicted on the basis of a simple structural representation of a component opens up interesting possibilities for refinement and application of the method.

25973 Adsorption on inorganic materials. 8. Adsorption of iodide on AgCl-filled carbon. Ho, P.C.; Kraus, K.A. (Oak Ridge National Lab., TN (USA)). *Journal of Inorganic and Nuclear Chemistry ;* **43**: No. 3, 583-587(1981).

Activated carbon containing 20 weight % of micron-sized silver chloride particles has been prepared and the absorptive properties of this filled carbon for iodide ions determined. The rate of adsorption of iodide was found to be sufficiently large to allow excellent iodide removal with small columns of the material at flow rates of several cm/min. The adsorption-exchange reaction occurs through the bulk of the silver halide particles and is not limited to their surfaces. The extent of the reaction is insensitive to the iodide concentration of the solution and to presence of a variety of supporting electrolytes, including large concentrations of chloride in the feed. The material seems promising for applications involving removal of radioactive iodide from solutions; removal of 98% of trace level iodides from several thousand column volumes of aqueous feed was demonstrated.

25974 Internal-standard method for multi-element neutron activation analysis of airborne particulates in Taiwan. Pung, T.C.; Chou, C.C.; Tsai, H.T.; Wu, S.C. (Inst. of Nuclear Energy Research, Lungtan, Taiwan). *Ho Tzu K'o Hsueh ;* **17**: No. 1, 19-25(Mar 1980).

An internal standard method has been applied for multielement determination of airborne particulates in Taipei and Kaoshiung areas by neutron-activation analysis using gold as an internal-standard element. Airborne particulates were collected on a glass fiber filter. A Ge(Li) detector coupled with HP 1024-channel pulse-height analyzer was used to analyze the irradiated samples. Six elements (Cr, Sb, Fe, Sc, Co and La) were determined.

25975 Simple and effective method for measurement of HTO and HT in environmental air. Chiu, J.H. (Inst. of Nuclear Energy Research, Lungtan, Taiwan). *Ho Tzu K'o Hsueh ;* **17**: No. 1, 45-49(Mar 1980). (In Chinese and English).

HTO in air is collected when it is passed through ethylene glycol bubblers. The air then is passed through a heated (400°C) 5g palladium black powder catalyst where the HT gas is oxidized to HTO and collected in the next ethylene glycol bubblers. The tritium activities absorbed in ethylene glycol are measured by liquid scintillation counting. The collecting efficiency of HTO is 96.4 +- 1.7% and that of HT is 101.8 +- 2.1% at 100 cm^3/min air flow rate and 7 days of sampling period. The method is suitable for tritium air sampling at high temperature and high humidity weather area.

25976 Experience with an analytical quality-control program. Harley, J.H. (Energy Research and Development Administration, New York, NY). *American Society for Testing and Materials, Special Technical Publication ;* No. 698, 257-269(1980). (CONF-780719—).

From Conference of the American Society for Testing and Materials; Johnson, VT, USA (9 Jul 1978).

Over the past few years there has been an increasing tendency to question analytical measurements. There has always been peer review, but now quality must be justified to the public as well. This is not unreasonable, and any analytical laboratory should be able to stand behind the quality of its work. The Environmental Measurements Laboratory has had a formal quality-control program since 1960. This has been used for both internal analyses and for measurements performed under contract to commercial laboratories. The program has consisted of submitting samples in the form of standards, blanks, or blind duplicates. In almost all cases, the analyst is not aware of which samples are the quality-control samples. The results of this program are published annually in Environmental Quarterly. The benefits of this program have been an increase in confidence by the data users and a sense of pride in the analyst for having produced useful measurements. In addition, problems of calibration drift, operator performance, and inadequacy of methods can be recognized at a reasonably early stage and the necessary corrective action taken. Extensive data covering-quality control samples, calibrations, and participation in intercomparisons are presented.

25977 Anion chromatography with low-conductivity eluents. II. Gjerde, D.T.; Schmuckler, G.; Fritz, J.S. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Journal of Chromatography ;* **187**: 35-45(1980).

Common inorganic anions can be separated on an anion-exchange column of low capacity using a very dilute solution of potassium benzoate or potassium phthalate as the eluent and a conductance detector. For each anion studied a plot of log adjusted retention time v. log eluent concentration yields a linear plot. Elution data for additional anions are reported with various resins and eluents. Several new practical separations of anion mixtures are given. By decreasing the eluent concentration with a resin of very low capacity, the sensitivity of detection can be improved so that it becomes feasible to separate mixtures of anions in the low ppB concentration range.

4002 Inorganic And Physical Chemistry

REFER ALSO TO CITATION(S) 24851, 24964, 25238, 25259, 25991, 26006, 26452

25978 (DOE/ER/10458—2) Vibrational energy-transfer kinetics in molecular disequilibrium. Progress report. Rich, J.W. (Calspan Corp., Buffalo, NY (USA)). Mar 1981. Contract AC02-79ER10458. 20p. NTIS, PC A02/MF A01.

A continuous wave CO laser was used to excite the vibrational mode of CO in gas mixtures. ^{13}C isotope enrichment was studied. High steady-state excitation of the CO vibrational mode (0.3 eV/molecule) was achieved, while a translational-rotational temperature near 300°K was maintained by the steady flow of cold gas into the cell. Kinetics of the observed C_2 formation were studied. Diagnostic experiments were begun to detect reaction intermediates in the enrichment process. (DLC)

25979 **(IS-M—316) VII. Overview of current status of solid-gas interface science.** Hansen, R.S. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 9p. (CONF-8006156—1). NTIS, PC A02/MF A01. Order Number DE81023793.

From Basic research needs and opportunities on interfaces and solar materials; Denver, CO, USA (30 Jun 1980).

The principal methods for establishing chemical composition, long range structure, short range structure, and nature of chemical bonding at the solid gas interface are reviewed. Electron and ion spectroscopies largely developed over the past two decades have vastly improved the ability to establish interface chemical composition, and developments over the past five years have done much to put determination of long range and short range structures on firm ground. The high vacuum requirements of these techniques limit their applications to interfaces whose stability under evacuation can be reasonably presumed. This is a serious limitation for many solar applications, and new methods of characterization not subject to it are badly needed. Some possibilities are indicated.

25980 **(LBL—12761) Treatment of ionic solutions over the entire miscibility range.** Pitzer, K.S. (Lawrence Berkeley Lab., CA (USA)). May 1981. Contract W-7405-ENG-48. 33p. (CONF-810589—1). NTIS, PC A03/MF A01. Order Number DE81023029.

From Annual meeting of the Bunsen Gesellschaft fur Physikalische Chemie; Marburg, F.R. Germany (29 May 1981).

Conductance and thermodynamic properties are considered for several ionic systems continuously miscible from the fused salt to dilute solution in water or another polar solvent. Over most of the composition range, the activities of the respective components of the ionic systems show the same patterns of behavior and can be represented by the same equations that were developed for nonelectrolytes. Consideration is also given to ionic systems of large but finite solubility, including mixed electrolytes. The dominant factor in the behavior of these systems is the strength of ion solvation in competition with intermolecular forces in the solvent and direct interionic forces. Strong ion solvation yields negative deviations from ideal solution behavior and vice versa.

25981 **(MLM—2817(OP)) Quadrupole interactions in liquid and solid deuterium.** McConville, G.T.; White, D. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 2p. (CONF-810809—7). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

From differential vapor pressure measurements in both liquid and solid deuterium, an effective D_2 molecular quadrupole moment has been determined from observed non-idealities of ortho-para mixtures.

25982 **(SAND—80-2594C) Applications of Fourier transform infrared spectroscopy to in situ catalyst surface studies.** Haaland, D.M.; Williams, F.L. (Sandia National Labs., Albuquerque, NM (USA); New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering). 1981. Contract AC04-76DP00789. 3p. (CONF-810666—1). NTIS, PC A02/MF A01. Order Number DE81023180.

From International conference on fourier transform infrared spectroscopy; Columiba, SC, USA (8 Jun 1981).

Fourier transform infrared spectroscopy (FTIR) is a powerful tool for studying surface species present on supported catalysts during normal reaction conditions of high temperature and/or pressure. A special high-throughput optical bench has been used to optimize the sensitivity of this system for high optical density catalyst samples. The infrared cell is designed to operate at high vacuum for adsorption studies or as a recycle-flow reactor. Improvements in spectral subtractions have been obtained by the precise repositioning of samples in the ir beam. The enhanced performance resulting from these modifications has been instrumental in improving the sensitivity for infrared surface studies of the reactions $C_6H_6 + 3H_2$ reversible C_6H_{12} and $2CO + O_2 \rightarrow 2CO_2$ over a Pt/Al_2O_3 catalyst. The bonding and geometry of benzene chemisorbed on the Pt surface have been determined from the infrared spectra. Simultaneous reaction rate and surface coverage measurements have also been made during CO oxidation on Pt/Al_2O_3. Hysteresis effects in both reaction rate and CO surface coverage are observed. The ir spectra indicate that islands of CO form on the Pt surface during reaction.

25983 **(SAND—81-0969C) Chemical makeup of Nb and Nb_3Sn films.** Rehn, V.; Green, A.K.; Rosenberg, R.A.; Loubriel, G.; Parks, C.C. (Sandia National Labs., Albuquerque, NM (USA); Naval Weapons Center, China Lake, CA (USA). Michelson Labs.; Lawrence Berkeley Lab., CA (USA)). 1981. Contract EY-76-C-04-0789. 8p. (CONF-810809—8). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

We report the identification and distribution of impurities found in films of Nb and Nb_3Sn which were grown by multiple-source electron-beam coevaporation. Both Auger-electron spectroscopy (AES) and photon-stimulated ion desorption (PSID) were used. The PSID results show large desorption yields of hydrogen from surface carbon, oxygen, silicon, and aluminum impurity sites on the Nb films. From the Nb_3Sn films, the dominant PSID yield was again hydrogen, which desorbed primarily from surface oxygen sites. Only after removal of 1 to 6 nm of material by Ar-ion sputtering was O^+ observed to be desorbed from Nb. O^+ desorption from Sn was never observed. The AES results showed only carbon, oxygen, and a trace of aluminum impurities in either material. Using Ar-ion sputter etching, the depth profiles of these impurities within the films were measured.

25984 **(SAND—81-1352C) Catalytic activity of shock-loaded TiO_2 powder.** Golden, J.; Williams, F.; Morosin, B.; Venturini, E.L.; Graham, R.A. (Sandia National Labs., Albuquerque, NM (USA); New Mexico Univ., Albuquerque (USA). Dept. of Chemical Engineering). 1981. Contract AC04-76DP00789. 5p. (CONF-810684—4). NTIS, PC A02/MF A01. Order Number DE81023161.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Catalytic activity measurements have been carried out on a pure TiO_2 powder which was explosively loaded and preserved for post-shock examination. The oxidation of CO in a flow reactor was used to show an enhancement in catalytic activity of over two orders of magnitude at 720K. The catalytic activity does not correlate with the concentration of two paramagnetic defects as indicated by ESR measurements.

25985 **(SAND—81-1455C) Shock-induced inorganic chemistry.** Morosin, B.; Graham, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 10p. (CONF-810684—10). NTIS, PC A02/MF A01. Order Number DE81024082.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

The fundamentals of chemical processes occurring in shock-compressed inorganic materials are reviewed. The materials survey presented complements previous reviews on this topic and examines specific topics from a different perspective. Future directions for research in this area are suggested.

25986 **Phase relationship, vaporization, and thermodynamic properties of neodymium hexaboride.** Storms, E.K. (Los Alamos Scientific Lab., NM). *Journal of Physical Chemistry ;* **85**: No. 11, 1536-1540(28 May 1981).

The Nd-B system was studied between $NdB_{4.41}$ and $NdB_{6.69}$, and between 1700 and 2100 K by Langmuir and Knudsen techniques to determine the phase relationship, the chemical activity of the components, the vaporization rate, and the vapor composition. At 1900 K, the neodymium hexaboride phase exists bwtween NdB_6

$_{008}$ and $NdB_{9.2}$ with a congruently vaporizing composition at $NdB_{6.057}$. The Gibbs energy of formation at the low boron boundary is $\Delta G/sub\ f/^{0} = 0.0323T - 131$ (kcal/mol), with a more negative value at the high boron boundary. The value for the tetraboride is -58 kcal/mol (-243 kJ/mol) at its high boron boundary.

25987 Size control of granules in pan and fluidized-bed granulators. Kono, H. Chicago, IL; Institute of Gas Technology (1981). 6p. (CONF-810581—2).

From Powder and bulk solids conference; Chicago, IL, USA (12 May 1981).

The granulation mechanism for preparing wet granules from powders in a pan granulator and in a fluidized-bed granulator was studied experimentally in relation to control of the size of granules. A granulation model was developed to understand these processes. In particular, the dispersion of fresh liquid and powder feeds in granulators was studied. It was found through experiments that small granules with diameters of 1 to 2 mm can be efficiently prepared by improving this dispersion.

25988 Energy transfer from PO excited states to alkali metal atoms in the phosphorus chemiluminescence flame. Khan, A.U. (Florida State Univ., Tallahassee). *Proceedings of the National Academy of Sciences of the United States of America ;* **77**: No. 12, 6952-6955(Dec 1980).

Phosphorus chemiluminescence under ambient conditions of a phosphorus oxidation flame is found to offer an efficient electronic energy transferring system to alkali metal atoms. The lowest resonance lines, $^{2}P/sub\ 3/2,1/2/ \rightarrow {}^{2}S/sub\ 1/2/$, of potassium and sodium are excited by energy transfer when an argon stream at 80°C carrying potassium or sodium atoms intersects a phosphorus vapor stream, either at the flame or in the postflame region. The lowest electronically excited metastable $^{4}II/sub\ i/$ state of PO or the $(PO...PO)^{*}$ excimer is considered to be the probable energy donor. The $(PO...PO)^{*}$ excimer results from the interaction of the $^{4}II/sub\ i/$ state of one PO molecule with the ground $^{2}II/sub\ r/$ state of another. Metastability of the donor state is strongly indicated by the observation of intense sensitized alkali atom fluorescence in the postflame region.

25989 (LA-tr—81-10) Zirconolite and its crystallographic characteristics. Pudovkina, Z.V.; Pyatenko, Yu. A. Translated from *Trudy Mineralogicheskogo Muzeya, Akademiya Nauk SSSR ;* **17**: 124-131(1966). 17p. NTIS, PC A02/MF A01.

Conclusions of this investigation are as follows: at relatively low heating temperatures (up to 800°C) of the domestic zirconolites and zirkelites, a cubic disordered metastable phase is formed which does not correspond to the original structure of the minerals; at high temperatures (1100 to 1200°C) the original pre-metamict structure of the mineral under consideration - which is derived from the CaF_2 - CeO_2 type is restored. The true symmetry of the structure is monoclinic but with a clearly expressed pseudohexagonality; the zirconolites and zirkelites described in our literature, as well as the variety of zirkelite from Ceylon constitute one mineral type; and the preferred name of this type is zirconolite.

4003 Organic Chemistry

REFER ALSO TO CITATION(S) 24868, 24877, 24908, 24916, 24920, 25980

25990 (DOE/BETC/IC—80/3(Vol.4), pp 2p, Paper 6) **Thermodynamic characterization of condensed-ring compounds.** Good, W.D.; Smith, N.K.; Gammon, B.E.; Draeger, J.A. (Dept. of Energy, Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 30, 1980.

Modernization of the low-temperature adiabatic calorimetry laboratory continues. Measurement of the thermodynamic properties of 1,2,3,4,5,6,7,8-octahydroanthracene is in progress. Spectroscopic studies are in progress on the alkylbenzenes and pyridines. Purification of six polynuclear aromatics, some hydrogenated and some containing nitrogen as a ring heteroatom, was completed. Several manuscripts also were completed.

25991 (DOE/ER/10603—1) Studies on unusually reactive metal powders. Preparation on new organometallic and organic compounds including potential new catalysts. Progress report, July 1, 1980-March 15, 1981. Rieke, R.D. (Nebraska Univ., Lincoln (USA). Dept. of Chemistry). 1981. Contract AC02-80ER10603. 7p. NTIS, PC A02/MF A01. Order Number DE81023295.

Efforts were concentrated on the preparation of Ni, Fe, Pd, and Pt and their use to prepare new organometallic and organic compounds. (DLC)

25992 (SAND—81-1350C) Electrical-to-chemical connection. Graham, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810684—5). NTIS, PC A02/MF A01. Order Number DE81023172.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

New data on shock-induced electrical polarization in polymers is presented for polysulfone, polystyrene, and polypyromellitimide. The polarization generated in polysulfone is the largest reported for any polymer. A strong correlation is observed between the number of benzene rings in the monomer repeat unit and the magnitude of the polarization.

25993 (SAND—81-1386C) Exploratory study of reactivity in organic compounds subjected to shock loading. Dodson, B.W. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810684—14). NTIS, PC A02/MF A01. Order Number DE81023166.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

An exploratory study of chemical reactions occurring in organic compounds under shock loading has been carried out. Early results on shock reactivity of the organic compounds acrylamide, adamantane, hexamethylenetetramine, naphthalene, and 1,6-diphenyl-2,4-hexadiyne have established two points: (1) organic reactions occur under shock loading; and (2) chemical structure strongly influences shock reactivity.

25994 Dielectric relaxation of oil-external microemulsions. Chou, S.I.; Shah, D.O. (Univ. of Florida, Gainesville). Contract AC1979BC10075. *Journal of Physical Chemistry ;* **85**: No. 11, 1480-1485(28 May 1981).

The dielectric properties of oil-external microemulsions consisting of monodisperse spherical droplets of radii from 115 to 175 A have been studied over a frequency range from 0.5 to 100 MHz. It is evident that there exist two consecutive relaxation processes within this frequency range, each of which has a well-defined average relaxation time with narrow distribution. A model for the dielectric relaxation of oil-external dispersions with thin shells has been proposed by unifying the theory of double-layer polarization, modified to take into account the finite thickness of the double layer, and the triphasic model of interfacial polarization. According to this model, the low-frequency relaxation time is proportional to the square of the radius of dispersed water droplets and the high-frequency relaxation time is proportional to the radius. Both relationships have been established and can be used to determine the surface charge density and the surface conductivity of oil-external microemulsion droplets. However, the magnitude of the dielectric constant cannot be described by the present model or any other model within the framework of Maxwell-Wagner theory. This inconsistency could be due to the formation of dynamic aggregates of microemulsion droplets under Brownian motion. The effect of substituting H_2O brine by D_2O brine has also been studied. It is shown that, while H_2O and D_2O havenearly identical dielectric constants, the dielectric properties of oil-external microemulsions containing H_2O or D_2O brine are distinctly different. It was found that the surface charge density, the dielectric relaxation times, and the dielectric increment of the H_2O system were ca. 2 to 4 times higher than those of the D_2O system. These observations indicate the importance of hydration effects on interfacial and double-layer polarizations in microemulsions.

25995 **(UCRL-Trans—11679) Picosecond spectroscopy of polar dye solutions at antistokes excitation.** Bushuk, B.A.; Rubinov, A.N.; Stupak, A.P. Translated from *Acta Physica et Chemica ;* **24**: 387-390(1978). 8p. NTIS, PC A02/MF A01.

In this article, the process of orientational rearrangement of solvates in solutions of complex organic molecules at room temperature is studied using the method of picosecond spectroscopy. With the excitation of an ethanol solution of unsubstituted rhodamine by a single picosecond pulse, at the first moment amplification was observed with a spectrum displaced to the red region by 6 nm compared to its usual position. In 350 picoseconds after the excitation, there was a displacement of the spectrum to the blue region, corresponding to orientational relaxation of the solvate.

4004 Electrochemistry

REFER ALSO TO CITATION(S) 25954

4005 Photochemistry

REFER ALSO TO CITATION(S) 25268, 25988

25996 **(DOE/ER/03416—21) Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines. Progress report, August 16, 1980-April 30, 1981.** Lampe, F.W. (Pennsylvania State Univ., University Park (USA). Dept. of Chemistry). 1981. Contract AS02-76ER03416. 21p. NTIS, PC A02/MF A01. Order Number DE81025636.

Investigation of the radiation-induced decompositions of silane, germane and phosphine systems during the report period may be subdivided into the following two types: (1) photochemical decompositions where initiation of the decomposition of silanes, germanes and phosphines by direct photolysis and by photosensitization techniques is carried out in flow systems that are analyzed continuously by mass spectrometry; (2) ion-molecule reactions where identification and study of the ion-molecule reactions characteristic of silane, germane and phosphine systems are conducted using the techniques of tandem and high-pressure mass spectrometry. Progress reports of the following studies are presented: formation of GeH_5^+ and the proton affinity of GeH_4; the 147-nanometer photolysis of methylsilane; the role of collision complexes in the reaction of silyl ions with ethylene; the 147-nanometer photolysis of phosphine-silane mixtures; the infrared multiphoton decomposition of silane; the infrared multiphoton decomposition of phosphine; the reaction of SiH_2 radicals with HCl; and the 147-nanometer photolysis of phosphine and phosphine-d_3.

25997 **(DOE/ER/06035—3) Hypersonic beam laser photolysis. Technical progress report, July 15, 1980-March 15, 1981.** Smalley, R.E. (Rice Univ., Houston, TX (USA)). 1981. Contract AS05-78ER06035. 10p. NTIS, PC A02/MF A01.

Current accomplishments are in the following areas: nozzle and molecular beam apparatus development; the CH_2 radical triplet-singlet problem; radicals of refractory metals; and laser synthesis of metal clusters. The pulsed nozzle which was completely redesigned is fully fluorine compatible and can operate at 10 Hz over a temperature range from 0°C to 200°C, and may now be used to prepare beams of a wide variety of halogen-containing species such as KrF, HgBr, etc. The photolytic process of forming CH_2 radical from ketene (CH_2CO) in a supersonic jet was investigated in detail. Current work is now focused on the benzyl radical and cold, well resolved spectra are being obtained without difficulty. Laser irradiation within the pulsed supersonic nozzle was very effective in producing organometallic intermediates such as aluminum and aluminum-acetyl adducts and permitted their study in a cold, collisionless beam. Clusters of [Fe(CO)k]/sub n/ when irradiated with sufficient intensity of 1930 A photons (ArF lasers), spontaneously rearranged to Fe/sub x/ + CO.

25998 **(DOE/ER/10424—1) Electron photoejection in carbanions. Progress report, July 1, 1980-June 30, 1981.** Tolbert, L.M. (Kentucky Univ., Lexington (USA). Dept. of Chemistry). 1981. Contract AS05-79ER10424. 24p. NTIS, PC A02/MF A01.

The results of our recent investigations in carbanion photochemistry are presented. Despite formidable energetic constraints, resonance-stabilized carbanions are able to transfer electrons to dimethyl sulfoxide with moderately high efficiencies. We have discovered an unusually long lifetime for the carbanion photoactive state, which partially explains the ability of an endothermic irreversible electron transfer to draw off excitation energy. A corollary to this result is that exoergonic electron acceptors are able to quench the excited state with extremely high efficiency. The efficiency of electron transfer is not clearly related to the formal ground state potential of the carbanions as measured by basicity. A new class of anions, the 2-aryl-1, 3-diphenylpropenyl anions, will allow us to more clearly separate ground state effects from excited state effects. We have also made significant observations on the reactivity of radicals with anions, a reaction class which has not previously been studied. Finally, we have developed a new method for calibration of photodetectors using disc calorimetry and computer techniques.

25999 **Laser-collision induced chemical reactions: A comparison of quantum mechanical and classical model results.** Kulander, K.C.; Orel, A.E. (Theoretical Atomic and Molecular Physics Group, Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Journal of Chemical Physics, The ;* **75**: No. 2, 675-680(15 Jul 1981).

We compare the results of a classical model for the laser enhancement of the H+LiF→Li+HF reaction to accurate quantum mechanical results. Structure in the reaction probability as a function of collision energy below the fieldfree threshold predicted classically by Orel and Miller is found to be less pronounced in the quantum results. A much better understanding of the various causes of the observed maxima and also of the reliability of this classical model are obtained as a result of these calculations. A fundamental inconsistency in the classical model introduced when the Langer modification is made which can lead to unphysical results is discussed and a procedure for correcting this inconsistency is presented. Improved results are obtained.

26000 **Evidence for photodissociation of water vapor on reduced $SrTiO_3$ (111) surfaces in a high vacuum environment.** Ferrer, S.; Somorjai, G.A. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of Physical Chemistry ;* **85**: No. 11, 1464-1466(28 May 1981).

We have observed D_2 photoproduction from D_2O vapor at a pressure of 1 x 10^{-7} torr on a reduced $SrTiO_3$ (111) crystal face at a temperature of 600 K. Electron energy loss spectroscopy data showed a decrease in the surface concentration of Ti^{3+} species while the crystal face was being illuminated and the D_2 photoproduced, indicating that the oxygen was being incorporated into the crystal lattice.

26001 **Disproportionation of semimethylene blue and oxidation of leucomethylene blue by methylene blue and by Fe(III). Kinetics, equilibria, and medium effects.** Hay, D.W.; Martin, S.A.; Ray, S.; Lichtin, N.N. (Boston Univ., MA). Contract EY-76-S-02-2889. *Journal of Physical Chemistry ;* **85**: No. 11, 1474-1479(28 May 1981).

The dependence on reaction medium of the kinetics of three ground-state elementary reactions occurring in the iron-methylene blue photoredox system has been investigated by studying the relaxation of the photostationary state and by flash photolysis. The rate constants which have been evaluated include 2k6, for disproportionation of semimethylene blue (S), k/sub -6/, for syn proportionation (the oxidation of leucomethylene blue (L) by methylene blue (MB)), and k_{10}, for the oxidation of leucomethylene blue by ferric ion. Variations of media include nature of the solvent and anions, ionic strength, and concentration of acid. Values of the equilibrium constant K_6 = k/sub -6/2k6 = $[S]^2/[L][MB]$ have been derived from the kinetic data and used in conjunction with potentiometric data to determine values of the one-electron standard re-

duction potentials, €/sup o'//sub MB/S/ and €/sup o'//sub S/L/ in several media. As in the iron-thionine photoredox system, the half-reduced dye, S, is a minor component of the photostationary state and oxidation of leuco dye by ferric ion appears to proceed via a metastable association complex of the reactants. Mechanistic interpretations of some of the medium effects are suggested.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 25996

26002 (DP-TR—19) Radiation stability of azo dyes in aqueous solutions. Panchenkov, G.M.; Kozlov, D.L.; Khabarov, V.N.; Molin, A.A. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). [nd]. Translation source information not available . 2p. NTIS, PC A02/MF A01. Order Number DE81024929.

The results of this work permit the proposal that decolorization of the azo dyes occurs mainly by a reduction mechanism, supposedly with formation of aromatic amines. It is established that the yield lies in the interval from 0.1 to 1.6 mol/100 ev; the rate of decolorization of azo dyes in alkaline and in neutral media is approximately the same; oxygen inhibits the radiation-chemical decolorization process; temperature in the interval 5 to 40°C does not influence the process; a relation is established between the structure of the azo dyes and their radiation stability.

26003 Radiation chemical studies of nickel-glycine. Hydrogen abstraction by OH radicals and oxidation by Br_2p1. Battacharyya, S.N.; Neta, P. (Univ. of Notre Dame, IN). *Journal of Physical Chemistry ;* **85**: No. 11, 1527-1529(28 May 1981).

Reactions of hydroxyl radicals with Ni(II)-glycine complexes were studied by pulse radiolysis and by product analysis. Radiolytic degradation of the complexes in N_2O-saturated solutions leads to the formation of carbonyl compounds. The nature and the yield of these products indicate that the transient formed by reaction of OH with the complex undergoes disproportionation. The optical absorption spectrum of this transient exhibits a maximum below 250 nm, which is similar to that observed with glycine alone. The reaction of Br_2^- with the complex is found to be too slow to be observed by pulse radiolysis. However, the reaction occurs in steady-state radiolysis and yields products different from those observed with OH. Specifically, the yield of formaldehyde is appreciably higher in the presence of Br^-. It is concluded that Br_2^- oxidizes the metal center of the Ni(II)-glycine complex to Ni(III), whereas OH reacts by hydrogen abstraction to form Ni(II)-coordinated glycine radical.

26004 Kinetics of free radical decay reactions in irradiated isotactic polypropylene. Gvozdic, N.; Basheer, R.; Mehta, M.; Dole, M. (Baylor Univ., Waco, TX). *Journal of Physical Chemistry ;* **85**: No. 11, 1563-1569(28 May 1981).

The kinetics of free radical decay reactions above and below the glass transition in isotactic polypropylene have been investigated for the decay reactions occurring both in a vacuum and in the presence of 550 torr of hydrogen gas. As expected the decay rate in vacuo is less below T/sub g/ at -26°C than above T/sub g/ at -4°C. Hydrogen markedly catalyzes the free radical decay at -4°C, but less so at -26°C, as expected because of the reduced hydrogen solubility at that temperature. The decay follows neither simple first-order nor second-order kinetics, nor is the decay a composite first-order reaction in contrast to the alkyl radical decay kinetics in bulk polyethylene. Instead, the data can be accurately represented by a new kinetic equation derived on the assumptions of a fraction of the initial free radicals decaying by a second-order mechanism and the remainder being converted by a first-order process into an identical free radical but in a location where it cannot react further.

4007 Radiochemistry And Nuclear Chemistry

26005 Tricatecholamide analogs of enterobactin as Ga and In radiopharmaceuticals. Moerlein, S.M.; Welch, M.J. (Washington Univ., St. Louis, MO (USA). Edward Mallinckrodt Inst. of Radiology); Raymond, K.N. (California Univ., Berkeley (USA). Dept. of Chemistry); Weitl, F.L. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Journal of Labelled Compounds and Radiopharmaceuticals ;* **18**: No. 1-2, 159(Jan-Feb 1981).

From 3. international symposium on radiopharmaceutical chemistry; St. Louis, MO, USA (16 - 20 Jun 1980).

26006 Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2i + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$. Bilotta, R.M.; Farrar, J.M. (Univ. of Rochester, NY). *Journal of Physical Chemistry ;* **85**: No. 11, 1515-1526(28 May 1981).

An experimental study of the title reactions over the collision energy range from 0.7 to 6.9 eV is presented. Over the entire collision energy range, a significant fraction of the products have internal excitation sufficiently high to undergo unimolecular decay to H_3O^+ or an isotopically substituted water cation. An examination of the reactions $D_2^+ + H_2O$ and $H_2^+ + D_2O$ and observation of H_2O^+ and HOD^+ products of unimolecular decay at 3.0 and 6.3 eV suggest that, at the lower collision energy, the recoil energy distributions are consistent with the results of phase space calculations including all vibrations of the H_2O^+ or HOD^+ product. At this collision energy, the unimolecular decay products have barycentric angular distributions with sharp forward-backward symmetry, suggesting that planar scattering with concomitant angular momentum polarization is an important dynamical feature in these reactions. At the higher collision energy, the complex osculates with a lifetime too short for rapid intramolecular energy transfer. We also present evidence for a direct reaction between H_2^+ and D_2O yielding HOD^+ and a bound HD molecule, proceeding through a four-center exchange reaction rather than through unimolecular decay of HD_2O^+.

26007 ^{82}Sr recovery from Mo irradiated for ^{77}Br production. Barnes, J.W.; Bentley, G.E.; Grant, P.M. (Los Alamos Scientific Lab., NM (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals ;* **18**: No. 1-2, 229(Jan-Feb 1981).

From 3. international symposium on radiopharmaceutical chemistry; St. Louis, MO, USA (16 - 20 Jun 1980).

26008 Synthesis and brain uptake of carbon-11 phenethylamine. Jay, M.; Digenis, G.A.; Chaney, J.E. (Kentucky Univ., Lexington (USA)); Washburn, L.C.; Byrd, B.L.; Hayes, R.L. (Oak Ridge Associated Universities, Inc., TN (USA)); Callahan, A.P. (Oak Ridge National Lab., TN (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals ;* **18**: No. 1-2, 237(Jan-Feb 1981).

From 3. international symposium on radiopharmaceutical chemistry; St. Louis, MO, USA (16 - 20 Jun 1980).

26009 Production, radiochemistry, and cross-section measurements for $^{103-105}$Ag. Lambrecht, R.M.; Guillaume, M.; Wolf, A.P. (Brookhaven National Lab., Upton, NY (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals ;* **18**: No. 1-2, 271(Jan-Feb 1981).

From 3. international symposium on radiopharmaceutical chemistry; St. Louis, MO, USA (16 - 20 Jun 1980).

4008 Combustion, Pyrolysis, And High-temperature Chemistry

REFER ALSO TO CITATION(S) 25079

26010 (DOE/NASA/2593—27) Combustion-system processes leading to corrosive deposits. Stearns, C.A.; Kohl, F.J.; Rosner, D.E. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center; Yale Univ., New Haven, CT (USA). High Temperature Chemical Reaction Engineering Lab.). 1981. Contract AI01-77ET10350. 25p. (CONF-810347—3; NASA-TM—81752). NTIS, PC A02/MF A01. Order Number DE81024030.

From NACE international conference on high temperature corrosion; San Diego, CA, USA (2 Mar 1981).

Degradation of turbine engine hot gas path components by high temperature corrosion can usually be associated with deposits even though other factors may also play a significant role. The origins of the corrosive deposits are traceable to chemical reactions which take place during the combustion process. In the case of hot corrosion/sulfidation, sodium sulfate has been established as the deposited corrosive agent even when none of this salt enters the engine directly. The sodium sulfate is formed during the combustion and deposition processes from compounds of sulfur contained in the fuel as low level impurities and sodium compounds, such as sodium chloride, ingested with intake air. In other turbine engine and power generation situations, corrosive and/or fouling deposits can result from such metals as potassium, iron, calcium, vanadium, magnesium, and silicon. Control strategies used to combat high temperature corrosion and fouling problems can be aided by improved understanding of the thermochemistry, kinetics, and dynamics of salt formation and deposition in the context of combustion system processes. The chemistry of sulfur and various metal salts in flame systems has been experimentally investigated. The flame chemistry has been related to deposition processes and corrosion. Deposition mechanisms have been studied, and deposition measurements have been made for a variety of systems. Deposition rate theories have been developed and evaluated. The theories have evolved from the simple transport of a single condensible vapor species to more general and accurate ones which include multicomponent vapor transport, thermal diffusion, variable gas properties across boundary layers, free stream turbulence, and particle size effects.

26011 **(LBL—12767) Soot volume-fraction profiles in a free-combusting boundary layer.** Beier, R.A.; Pagni, P.J. (Lawrence Berkeley Lab., CA (USA)). May 1981. Contract W-7405-ENG-48. 10p. (CONF-810804—8). NTIS, PC A02/MF A01.

From National heat transer conference; Milwaukee, WI, USA (2 Aug 1981).

Carbon particulate volume fraction profiles and approximate particle size distributions are measured in a free laminar combusting boundary layer for several liquid hydrocarbon fuels and PMMA (polymethylmethacrylate). A multiwavelength laser transmission technique determines a most probable particle radius and a total particle concentration, which are the two unknown parameters in an assumed Gauss size distribution. In the combusting boundary layer, a sooting region exists between the pyrolyzing fuel surface and the flame. The liquid fuel soot volume fractions range from f/sub v/ $\sim 10^{-7}$ for n-heptane, a paraffin, to f/sub v/ $\sim 10^{-5}$ for toluene, an aromatic. The PMMA soot volume fractions, f/sub v/ $\sim 5 \times 10^{-7}$, are approximately the same as the values previously reported for pool fires. The soot volume fractions increase slightly with downstream distance, while the standoff distance of the maximum in the f/sub v/ profile appears to approach the converging streamline. Convection of carbon particles broadens the soot region downstream. For all fuels tested, a most probable radius between 20 nm and 50 nm is obtained which varies only slightly with distance both downstream or normal to the fuel surface.

42 ENGINEERING

4201 General Engineering

REFER ALSO TO CITATION(S) 25442

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 24862, 24943, 24995, 25381, 25479, 25481, 25499, 25512, 25647, 26067, 26317, 26686

26012 **(AD-A—090549) Fundamental experiment at liquid helium temperature. Final report 1 Oct 74-31 Sep 79.** (Stanford Univ., CA (USA). Dept. of Physics). Sep 1979. Contract F44620-75-C-0022. 14p. NTIS, PC A02/MF A01.

Fundamental Experiments at Liquid Helium Temperature, October 1, 1974 to September 31, 1979. Our purpose in this report is to summarize the research undertaken during this period, identifying the research topics and the principal results obtained. (Author)

26013 **(BDX—613-2582) Training manual for precision hand deburring, Part 4.** Gillespie, L.K. (Bendix Corp., Kansas City, MO (USA)). Jun 1981. Contract AC04-76DP00613. 177p. NTIS, PC A09/MF A01. Order Number DE81025605.

The last of 4 parts, this training manual is designed for use by machinist trainees, production workers, and others removing burrs from precision miniature parts. The manuals are written to be self-teaching and are intended to be used with 2 hours of training each day, along with another 6 hours of bench work in deburring. This part describes the mechanized deburring processes and when they should be used in place of hand deburring. Barrel tumbling, centrifugal barrel tumbling, vibratory deburring, electropolish and electrochemical deburring, and blasting processes are described. Time studies, approaches for large parts, common workpiece materials, burr properties, and the importance of finding the best deburring method also are discussed.

26014 **(BDX—613-2594) Electrochemical deburring.** Gillespie, L.K. (Bendix Corp., Kansas City, MO (USA)). Jul 1981. Contract AC04-76DP00613. 94p. NTIS, PC A05/MF A01. Order Number DE81025609.

The deburring of many features is often a time-consuming and inherently operator-variable process. Electrochemical deburring is a rapid and controlled process capable of removing burrs economically from many otherwise-difficult features. On many edges, this type of deburring can maintain a 0.005-in. (127.0-μm) maximum edge break (radius). Although well-suited for parts as small as a 1/4-in. cube, this process has been found to be particularly suited for 303 stainless steel parts that have intersecting holes, hard-to-reach areas, threaded features, and multiple cutouts. Observable side effects can be controlled and have presented no hindrances to production use on miniature parts.

26015 **(BDX—613-2634) PTTOPT APT postprocessor.** O'Hare, G.A. (Bendix Corp., Kansas City, MO (USA)). Jun 1981. Contract AC04-76DP00613. 204p. NTIS, PC A10/MF A01. Order Number DE81024453.

The PTTOPT postprocessor supports a number of point-to-point machine tools and their corresponding machine control units: Wiedeman N/C Turret Punch Press, Knight Model 65 Jig Borer, Burgmaster 2BHT Drill with Ferranti Control, Burgmaster 2BHT Drill with G.E. Control, Burgmaster 2BHT Drill with Pratt and Whitney Control, Burgmaster 3BHT Drill with G.E. Control, CSIP 3K Jig Borer with Sperry Control, and Moore Model 3 Jig Bore with Bendix Dynapath Control. This program conveys information from the APT processor to the machine control unit to develop a desired geometric configuration of a part. The postprocessor deals with machine tool geometry and dynamics as well as the control unit options and input characteristics.

26016 **(BDX—613-2635) ADVCON APT postprocessor.** O'Hare, G.A. (Bendix Corp., Kansas City, MO (USA)). Jun 1981. Contract AC04-76DP00613. 112p. NTIS, PC A06/MF A01. Order Number DE81024463.

The ADVCON postprocessor is a modification of an existing postprocessor which supported several different drilling machines. The ADVCON postprocessor has been modified to support the Advance Control 93 R/D CNC routing/drilling machine exclusively. This postprocessor conveys information from the APT processor to the machine control unit and is concerned with placing a tool on a part to develop the desired geometric configuration. The postprocessor deals with machine tool geometry and dynamics as well as the control unit options and input characteristics. Software is available from the National Energy Software Center, Argonne National Laboratory, 8700 South Cass Avenue, Argonne, IL 60439.

26017 **(CONF-800980—38) NbN materials development for practical superconducting devices.** Kampwirth, R.T.; Gray, K.E. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 5p. NTIS, PC A02/MF A01. Order Number DE81023891.

From Applied superconductivity conference; Santa Fe, NM, USA (29 Sep 1980).

Power switches such as a Superconducting Fault Current Limiter require large cross sectional area superconductors with both high critical current density J/sub c/ and normal state resistivity rho/sub n/. Large values of J/sub c/ and rho/sub n/ have been previously reported in small cross sectional area weak links of NbN. We report on reactively sputtered NbN films up to 5 μm thick and 2.2 cm wide which have rho/sub n/ $>$ 200 $\mu\Omega$ cm and a self-field J/sub c/ up to 10^6 A/cm^2. Severe degradation in J/sub c/ was observed with increasing film width and for millisecond current pulses. This degradation could be substantially reduced by stabilization with either low rho/sub n/ normal metal or the use of a sapphire substrate. The resistivity and critical current dependence both imply Josephson coupled grains and the results will be discussed within that model.

26018 **(CONF-810583—1) Packaging configurations and handling requirements for nuclear materials.** Jefferson, R.M. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 18p. NTIS, PC A02/MF A01.

From Rail carrier workshop; Columbus, OH, USA (13 May 1981).

The basic safety concepts for radioactive material are that the package is the primary protection for the public, that the protection afforded by the package should be proportional to the hazard and that the package must be proved by performance. These principles are contained in Department of Energy (DOE), Nuclear Regulatory Commission (NRC) and Department of Transportation (DOT) regulations which classify hazards of various radioactive materials and link packaging requirements to the physical form and quantities being shipped. Packaging requirements are reflected in performance standards to guarantee that shipments of low hazard quantities will survive the rigors of normal transportation and that shipments of high hazard quantities will survive extreme severity transportation accidents. Administrative controls provide for segregation of radioactive material from people and other sensitive or hazardous material. They also provide the necessary information function to control the total amounts in a conveyance and to assure that appropriate emergency response activities be started in case of accidents or other emergencies. Radioactive materials shipped in conjunction with the nuclear reactor programs include, ores, concentrates, gaseous diffusion feedstocks, enriched and depleted uranium, fresh fuel, spent fuel, high level wastes, low level wastes and transuranic wastes. Each material is packaged and shipped in accordance with regulations and all hazard classes, quantity limits and packaging types are called into use. From the minimal requirements needed to ship the low hazard uranium ores or concentrates to the very stringent requirements in packaging and moving high level wastes or spent fuel, the regulatory system provides a means for carrying out transportation of radioactive material which assures low and controlled risk to the public.

26019 (DOE/BETC/IC—80/3(Vol.1), pp 3p, Paper 22) **Electrodril system field test program: Phase II, Task C deep drilling system demonstration.** Taylor, P.D. (General Electric Co., Houston, TX). 1980. NTIS, PC A15/MF A01.

In Resource assessment. Annual report, October 1, 1979-September 30, 1980.

The results of the Phase II, Task C, Electrodril Deep Drilling System drilling demonstrations are documented. Task C, initiated in November 1978, followed the successful completion of the Systems Verification test program and consisted of two drilling demonstrations under operational conditions at two operational well sites. These two demonstrations were conducted in April and June 1979. The criteria established to guide selection of drilling sites for the demonstration are included. The test planning developed for each demonstration site is also included. Accomplishments are delineated as are the post test analyses from both drill sites. The report concludes that, from a technical viewpoint, the fundamental concept of Electrodril remains valid. The post test analyses indicate that the system problems are limited to the connectors and are centered around their manufacturing process. Recommendations for changes in the connector process, inspection and acceptance test are provided. Finally, the testing required to qualify new connectors and demonstrate functional integrity is outlined.

26020 **(GA-A—16161) Experiments on vibration of heat-exchanger tube arrays in cross flow.** Blevins, R.D.; Gibert, R.J.; Villard, B. (General Atomic Co., San Diego, CA (USA); CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Apr 1981. Contract AT03-76ET35301. 30p. (CONF-810801—44). NTIS, PC A03/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

A series of tests has been made at the Commissariat a L Energie Atomique, Saclay, France, in cooperation with General Atomic Company, San Diego, on flow-induced vibration of simulated heat exchanger tube bundles in a cross flow of air. The tests were of two types. In the first type, a tube instrumented with pressure transducers was inserted at various locations in a tube bundle. Measurements were made of pressure spectra, coherence, and lift force. It was found that the turbulence-induced pressures rise from a low value at the bundle entrance to a relatively high value within the bundle. In the second type of test, tube bundles were fabricated from flexible plastic tubes, cantilevered off a tube sheet, and the vibration induced by cross flow was observed. An investigation was made of the effect of tube-to-tube frequency difference and spacing on the onset of instability. It was found that while present theory often qualitatively predicts the correct trends, it may not be quantitatively accurate in many cases.

26021 **(LA-UR—81-1962) Ultraprecision machining of optics at Los Alamos.** Rhorer, R.L.; Gauler, A.L.; Colston, E.W.; Ruhe, J.R. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. NTIS, PC A02/MF A01. Order Number DE81025364.

Ultraprecision machine tools are used at Los Alamos for single point diamond turning of optics and other precision parts. Measurements of a 50-mm-dia copper flat are used to illustrate the quality of a part which can be machined on the Moore No. 3 lathe. Measurements of a 0.4-m-dia aluminum mirror with a 20-m radius-of-curvature are presented as an example of a part machined on the Moore No. 5 lathe. A varying frequency sine wave grating is used to show a type of special optical grating which can be produced using the Pneumo lathe.

26022 **(ORNL/TM—7665) Using GIFTS on the Cray-1 for the large coil test facility test: stand design analysis.** Baudry, T.V.; Gray, W.H. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 26p. NTIS, PC A03/MF A01. Order Number DE81024150.

The GIFTS finite element program has been used extensively throughout the Large Coil Test Facility (LCTF) test stand design analysis. Effective use has been made of GIFTS both as a preprocessor to other finite element programs and as a complete structural analysis package. The LCTF test stand design involved stress analysis ranging from simple textbook-type problems to very complicated three-dimensional structural problems. Two areas of the design analysis are discussed.

26023 **(SAND—80-2865C) Numerical modeling of oblique hypervelocity impact using two-dimensional plane strain models.** Brown, W.T. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810684—12). NTIS, PC A02/MF A01. Order Number DE81024077.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

A numerical procedure has been developed to obtain information regarding the hypervelocity impact of a sphere onto a plate by considering the corresponding plane strain problem. The method consists of treating a rod as a superposition of an infinite chain of spheres and then numerically unfolding information about a single sphere. This technique has been used to calculate the peak pressure distribution when the impact is normal to the plate surface and excellent results were obtained. When extended to oblique impact problems, physically reasonable results are obtained but at this time no independent checks are available.

26024 (SAND—81-0810) Nonconsumable arc melting furnace. Fisher, R.W. (Sandia National Labs., Albuquerque, NM (USA)). May 1981. Contract AC04-76DP00789. 29p. NTIS, PC A03/MF A01. Order Number DE81024491.

A nonconsumable arc melting furnace capable of producing 100 cm^3 ingots of a variety of metal alloys in a controlled environment has been designed and is operational in the Melting and Solidification Laboratory/SNLA. Design, fabrication, assembly, and operational information regarding this furnace system is presented.

26025 (UCID—18993) MORSE-C: a CDC-7600 program designed to solve nuclear criticality problems by using the Monte-Carlo method. Wilcox, T.P. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 30 Jan 1981. Contract W-7405-ENG-48. 219p. NTIS, PC A10/MF A01.

This user's manual covers this latest version of the MORSE-C code which solves the multiple energy group form of the Boltzmann transport equation in order to obtain the eigenvalue (multiplication) when fissionable materials are present. Cross sections for up to 100 energy groups may be employed. The angular scattering is treated by the usual Legendre expansion as used in the discrete ordinates codes. Upscattering may be specified. The geometry is defined by relationships to general 1st or 2nd degree surfaces. Array units may be specified. Output includes, besides the usual values of input quantities, plots of the geometry, calculated volumes and masses, and graphs of results to assist the user in determining the correctness of the problem's solution. Appendix II of this report contains the code listing with its numerous comments which should simplify finding an answer to any specific question the reader might have about MORSE-C. The remaining sections of this report explain how to obtain the code, how to set-up the input for a specific problem, how to understand the output, and then illustrates two typical problems run with the code.

26026 (UCRL—85298) Railguns for equation-of-state research. Hawke, R.S.; Brooks, A.L.; Mitchell, A.C.; Fowler, C.M.; Peterson, D.R.; Shaner, J.W. (Lawrence Livermore National Lab., CA (USA); Los Alamos National Lab., NM (USA)). 18 Jun 1981. Contract W-7405-ENG-48. 6p. (CONF-810684—33). NTIS, PC A02/MF A01. Order Number DE81024258.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

It appears that a railgun can be used to accelerate an impactor plate to velocities of 10 to 40 km/s, which could generate shock pressures of 1 to 10 TPa. As a first step to determining the potential and limits of railgun accelerators for shock-wave equation-of-state research, a joint team of scientists and engineers at Los Alamos National Laboratory and Lawrence Livermore National Laboratory have initiated railgun research. We have utilized a combined capacitor bank and magnetic flux compression generator to power railguns and have demonstrated the feasibility of accelerating projectiles to $\sim$ 10 km/s. This paper reports the status of experimental research directed toward launching EOS impactors and achieving higher velocities.

26027 Identification of quench origins in a superconductor with acoustic emission and voltage measurements. Tsukamoto, O.; Maguire, J.; Bobrov, E.; Iwasa, Y. (Francis Bitter National Magnet Laboratory, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Applied Physics Letters ;* **39**: No. 2, 172-174(15 Jul 1981).

The acoustic emission and voltage measurements were used to identify quench sources in a current-carrying superconductor. The sources identified were (i) conductor motion, (ii) epoxy cracking, and (iii) pure joule heating resulting from the conductor reaching critical current. The combination of these two techniques appears to be a promising diagnostic tool in probing premature quenches in superconductors and superconducting magnets.

26028 Ultrasonic extensometry for determining bolt preload in heavy industry: from petrochemical to reactors. Erdman, D.C. (Raymond Engineering, Inc., Middletown, CT). pp 138-144 of Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space. Azusa, CA; Society for the Advancement of Material and Process Engineering (1981).

From SAMPE symposium/exhibition; Los Angeles, CA, USA (28 Apr 1981).

Use of ultrasonic extensometers has found wide application for bolt preload determination in airborne and aerospace applications where elongation measurement accuracy is often required to .0001". Experience has now been gained in heavy industry with fasteners up to 12 feet long, often on studs and bolts with relatively rough head surfaces. Here, accuracy may be reduced to .001 inch, a figure far better than available from torque wrenches. This paper describes some of these heavy industry applications.

26029 Airborne cathodic-protection surveys. Stamm, M.E.; Read, W.A. San Mateo, CA; Pacific Coast Gas Association (1980). 22p. (CONF-8003142—1).

From Pacific Coast Gas Association operating section transmission conference; Salt Lake City, UT, USA (31 Mar 1980).

Department of Defense submarine location technology has been applied to the specific need of monitoring of cathodic protection currents. A system has been developed and successfully tested which measures, from an airborne platform, the cathodic protection current in submerged transmission pipelines. Two independent systems are available from this technology. The first measures rectifier output, and the second measures the cathodic protection current to the electrical midpoint on both single and multiple pipelines.

26030 Ten years with turbine metering. Judd, H.C. San Mateo, CA; Pacific Coast Gas Association (1980). 6p. (CONF-8003142—3).

From Pacific Coast Gas Association operating section transmission conference; Salt Lake City, UT, USA (31 Mar 1980).

The operation and performance experience in using 110 turbine meters to monitor the gas flow in turbines used on natural gas pipelines are discussed. Information is included on turbine meter selection, installation, calibration, performance testing, failures, and maintenance. (LCL)

4203 Lasers

26031 (AD-A—090343) Time dependent Navier-Stokes solution of a turbulent gas jet ejected from a rectangular orifice into a high-subsonic crossflow. Doctoral thesis. Golbitz, W.C. (Air Force Inst. of Tech., Wright-Patterson AFB, OH (USA). School of Engineering). Jun 1980. 188p. NTIS, PC A09/MF A01.

High temperature exhaust gases from an airborne chemical laser ejected at a jet to freestream dynamic pressure ratio (Q) of 0.15 from an aspect ratio 1.75 rectangular diffuser exit aligned parallel to the ambient crossflow was numerically simulated. The time dependent, three-dimensional Navier-Stokes equations and a species conservation equation were solved. Diffusive flux effects caused by concentration gradients as well as variable transport and thermodynamic properties were incorporated into the numerical model. Turbulence closure was achieved by a locally varying velocity defect eddy viscosity model. Chemical reactions betwen the exhaust gases and the crossflow were proscribed. The trajectory of the jet plume, the extent of recirculation zones, and regions with high rates of heat transfer were defined. Simplified analyses demonstrated that essential flow phenomena were replicated. Convective processes dominated the low Q jet-crossflow interaction. Thermal diffusion had significantly greater effect than molecular diffusion for the jet-crossflow gases simulated. Jet penetration was dependent upon the molecular weight of the injectant for the constant Q constraint. A molecular weight correction factor was empirically used to synthesize the trajectory of one gas from that of another gas and to correct empirical trajectory formulae for molecular weight variances. Sensitivity analyses relating heat transfer to the injection surface from the jet plume with the magnitude of the turbulence diffusivities were conducted.

26032 (CONF-810630—6) Simple optoacoustic energy meter for pulsed lasers. Shaw, R.W. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE81024122.

From 2. international photoacoustic spectroscopy conference; Berkeley, CA, USA (22 Jun 1981).

A simple optoacoustic energy meter for pulsed lasers is described. This instrument is sensitive (0.24 microjoule noise equivalent energy), accurate (+-5% over 3.5 decades), and inexpensive.

26033 (UCRL—85653) Theoretical investigation of a 10-μm free-electron laser amplifier using a 50-MeV multi-kA electron beam. Neil, V.K.; Prosnitz, D. (Lawrence Livermore National Lab., CA (USA)). 24 Jun 1981. Contract W-7405-ENG-48. 8p. (CONF-810620—4). NTIS, PC A02/MF A01.

From 4. international topical conference on high-power electron and ion-beam research and technology; Palaiseau, France (29 Jun 1981).

This work presents theoretical calculations describing the application of an electron beam of 50 MeV energy and several kA current to a free electron laser (FEL) experiment at 10.6 μm signal wavelength. The device is a single pass, high gain amplifier utilizing a planar wiggler with field strength B/sub w/ decreasing with distance down the device. The critical role of beam emittance in determining the required input laser energy and gain of the amplifier is discussed.

26034 Effect of rare-gas diluents on the performance of an XeCl laser pumped by a high-intensity electron beam. Tisone, G.C.; Hoffman, J.M. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Applied Physics Letters ;* **39**: No. 2, 145-147(15 Jul 1981).

The effect of various rare-gas diluents on the operating parameters of the XeCl laser has been investigated. The laser was electron-beam pumped at an excitation rate of roughly-equal3 MW/cm^3 and a pulse duration of 50 nsec. Contrary to previous results we found that the intrinsic efficiency, small-signal gain, and absorption were independent of the rare-gas diluent. The intrinsic efficiency was roughly-equal 4%, the small-signal gain was 0.18 cm^{-1}, and the absorption coefficient was between 0.04 and 0.05 cm^{-1}. A saturation intensity of 3 MW/cm^2 was obtained from a modified Rigrod analysis of the data.

26035 16-μm laser oscillation in propyne. Fischer, T.A.; Wittig, C. (Department of Electrical Engineering, University of Southern California, University Park Los Angeles, CA 90007). *Applied Physics Letters ;* **39**: No. 1, 6-8(1 Jul 1981).

An optically pumped propyne laser with tunable output in the 609—637-cm^{-1} region is reported. The pump source is a transverse electric atmosphere CO_2 laser, and 16-μm laser energies as high as 6 mJ are obtained.

26036 Efficient second-harmonic generation of Nd:YAG laser radiation using warm phasematching $LiNbO_3$. Byer, R.L.; Park, Y.K.; Feigelson, R.S.; Kway, W.L. (Applied Physics Department, Stanford University, Stanford, California 94305). LLL 3488009. *Applied Physics Letters ;* **39**: No. 1, 17-19(1 Jul 1981).

Warm phasematching $LiNbO_3$ (T/sub p/m ~120 °C) has been used to achieve greater than 40% SHG efficiency of an acousto-optic Q-switched Nd:YAG laser. The growth of high-quality $LiNbO_3$ crystals suitable for efficient noncritical second-harmonic generation is possible owing to the significantly lowered index damage annealing temperature.

26037 Tunable, ultrahigh-spectral-brightness ArF* excimer laser source. Egger, H.; Srinivasan, T.; Hohla, K.; Scheingraber, H.; Vidal, C.R.; Pummer, H.; Rhodes, C.K. (Department of Physics, University of Illinois at Chicago Circle, Box 4348 Chicago, Illinois 60680). DE-AC02-79ER10350. *Applied Physics Letters ;* **39**: No. 1, 37-39(1 Jul 1981).

An extremely high spectral-brightness ArF* 193-nm excimer source with the following output pulse characteristics is described: ~30-mJ pulse energy, ~5-nsec pulse duration, spectral width less than 260 MHz, absolute frequency control to within 1.8 GHz, ~5 x 15-μrad beam divergence, and repetition rate up to 10 Hz. Within the uncertainty of measurement, the spectral width of the output radiation is Fourier transform limited and the beam divergence corresponds to the diffraction limit of the radiating aperture.

26038 Particle simulations of a finite-length free electron laser. Liewer, P.C.; Lin, A.T.; Dawson, J.M.; Caponi, M.Z. (University of California, Los Angeles, California 90024). DE-AM03-76 SF 00010 PAZ 6. *Physics of Fluids ;* **24**: No. 7, 1364-1372(Jul 1981).

One-dimensional particle simulations of a finite-length free electron laser show that the convectively-unstable, short-wavelength mode is the dominant instability initially for systems long compared with the growth length of the mode. Also, a generalized one-dimensional linear theory of a finite length system has been derived with all kinetic effects included. Comparison between the unstable modes seen in the simulation and those predicted by this theory are in good agreement. However, the simulations show a significantly higher efficiency than that predicted by the theory when trapping by a single mode is the saturation mechanism. This may be caused by a local dc electric field (space charge fields) that arises self-consistently as the beam slows down.

26039 Optogalvanic effect as a detector for intracavity atomic absorption in a cw dye laser. Zalewski, E.F.; Keller, R.A.; Apel, C.T. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Applied Optics ;* **20**: No. 9, 1584-1587(1 May 1981).

It is demonstrated that the optogalvanic effect in a sodium hollow cathode discharge is a sensitive detector specific to the intracavity absorption of sodium atoms in a flame. In this feasibility study the variation of the optogalvanic signals vs the sodium concentration in the flame indicated a detection limit below 1 ng/ml. The sensitivity can be easily improved, and this technique is applicable to other atoms and Doppler-free intermodulation spectroscopic detection methods.

26040 Effects of passive isolation on several optically pumped far-infrared laser lines. Mansfield, D.K.; Tesauro, G.J.; Johnson, L.C.; Semet, A. (Princeton University, Plasma Physics Laboratory, Princeton, New Jersey 08544). DE-AC02-76-CH03073. *Optics Letters ;* **6**: No. 5, 230-232(May 1981).

The effects of a recently introduced passive-isolation scheme for optically pumped far-infrared lasers have been investigated on several well-known far-infrared laser lines. In addition to increasing the laser output stability, the isolation scheme alters the pump-to-far-infrared power-conversion efficiency and the polarization state of the far-infrared output.

26041 Unified single-pass model of linewidths in the Haensch, single- and double-grating grazing-incidence dye lasers. Iles, M.K. (Ames Laboratory, Iowa State University, Ames, Iowa 50011). W-7405-ENG-82;WPAS-KC-03. *Applied Optics ;* **20**: No. 6, 985-988(15 Mar 1981).

A N_2-pumped dye laser is modeled as a spectrometer. An equivalent entrance/exit slit function is developed and used to calculate the single-pass linewidths for the Hansch, single- and double-grating grazing-incidence dye laser cavities. The results of these detailed calculations are expressed in grating-dependent terms to show the unity of the three solutions and to illustrate performance differences of the three cavities for any particular grating size, groove spacing, and order.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 25570, 25572, 26031

26042 De-entrainment on vertical elements in air droplet cross flow. Dallman, J.C.; Kirchner, W.L. (Los Alamos Sci Lab, NM). *American Society of Mechanical Engineers, [Paper] ;* No. 80-WA/HT-46, 8(Nov 1980).

De-entrainment phenomena on vertical elements in air-water droplet cross flow are generated using a horizontal array of water spray nozzles and a draft-induced wind tunnel. These conditions are used to obtain experimental values of the de-entrainment efficiency of isolated elements and of an array of 101.6-mm-diam cylinders. A flow model is developed that extrapolates the de-entrainment efficiency of isolated elements through the use of a correlation for the "interference effect" to predict the efficiency of large arrays of similar elements. 10 refs.

26043 Numerical study of natural convection in a horizontal porous layer subjected to an end-to-end temperature difference. Hickox, C.E.; Gartling, D.K. (Sandia Lab, Albuquerque, NM). *American Society of Mechanical Engineers, [Paper]*; No. 80-WA/HT-39, 8(Nov 1980).

A numerical study of steady, natural convection in a fluid-saturated, horizontal, porous layer subjected to an end-to-end temperature difference is reported. The analysis is performed using a finite element computer program based on the Galerkin form of the finite element method. Heat transfer rates are predicted for aspect ratios ranging from 0.1 to 0.5 and Rayleigh numbers in the range 25 to 200. 11 refs.

4205 Materials Testing

REFER ALSO TO CITATION(S) 25503, 25934

26044 (BDX—613-2625) Development of fracture toughness measurement capability by ultrasound. Final report. Swanson, G.D. (Bendix Corp., Kansas City, MO (USA)). Jun 1981. Contract AC04-76DP00613. 26p. NTIS, PC A03/MF A01. Order Number DE81025520.

A correlation was developed between ultrasonic wave propagation factors and fracture toughness for Ti-6Al-6V-2Sn alloy. The important microstructural dimension for ultrasonic wave attenuation in this two-phase alloy appears to be the width of the β phase between the needlelike α-phase subgrains. Test specimens must have flat and parallel surfaces and be coupled to the ultrasonic transducer by a thin, uniform couplant layer. Good impedance matching of the specimen-couplant-transducer combination to the ultrasonic pulser-receiver is necessary for obtaining acceptable echo waveforms. This technique is a research test and requires a very knowledgable operator for application to a two-phase metal.

26045 (IS-M—328) Displacement discontinuity method applied to NDE-related stress problems. Zachary, L.W.; Skillings, B.J. (Ames Lab., IA (USA)). 1981. Contract W-7405-ENG-82. 26p. (CONF-810587—1). NTIS, PC A03/MF A01. Order Number DE81024003.

From 17. Midwestern mechanics conference; Ann Arbor, MI, USA (6 May 1981).

The use of Crouch's displacement discontinuity method to model surface and subsurface flaws was illustrated. The method has a built in semi-infinite solution that is very advantageous in the surface and near surface problems. The method was also illustrated on finite width plates. DDM is a powerful tool especially when applied to cracks. Its use with NDE related problems can be very helpful. It can be used to determine which parameters of a flaw such as size, shape, and orientation are the most important from a fracture mechanics point of view. The NDE techniques having the ability to obtain these parameters can be used on the particular problem.

26046 (SAND—81-1477C) Sandia 25-meter compressed helium/air gun. Setchell, R.E. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 4p. (CONF-810684—2). NTIS, PC A02/MF A01. Order Number DE81024068.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

For nearly twenty years the Sandia 25-m compressed gas gun has been an important tool for studying condensed materials subjected to transient shock compression. Major system modifications are now in progress to provide new control, instrumentation, and data acquisition capabilities. These features will ensure that the facility can continue as an effective means of investigating a variety of physical and chemical processes in shock-compressed solids.

26047 (SAND—81-1528C) Sandia shock thermodynamics applied research facility. Chhabildas, L.C. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810684—1). NTIS, PC A02/MF A01. Order Number DE81024066.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

A brief description of the Sandia Shock Thermodynamics Applied Research Facility is given. Three different smoothbore guns are used to launch projectiles for controlled planar impact studies. Combined pressure-shear loading conditions can also be obtained through use of an intervening anisotropic crystal. Time-resolved interferometric and holographic instrumentation is used for diagnostics. This facility has the unique capability of providing time-resolved measurements in shock loaded specimens over the stress range 0.1 to 700 GPa.

4206 Safety Engineering

REFER ALSO TO CITATION(S) 26076

4207 Vacuum Engineering

26048 Pressure surge limiting valve for vacuum pump inlet piping. Wurstner, R.P. (Mound Facility, Miamisburg, OH). Contract AC04-76-DP00053. pp 254-256 of Proceedings: tritium technology in fission, fusion, and isotopic applications. Wittenberg, L.J. (comp.). La Grange Park, IL; American Nuclear Society (1980).

From Tritium technology in fission, fusion, and isotopic applications; Dayton, OH, USA (29 Apr 1980).

Often, elevated pressures (above 10 psia) in vacuum systems adversely affect vacuum pump life through excessive vibration and seal failure. To date this problem is circumvented by upstream surge volumes, electro-mechanical control valves, or technician control of line flows. The recently developed pressure surge limiting valve (PSLV) is small, non-electrical, fully automatic, and applicable to various sized vacuum pump systems. The valve is either attached directly upstream of the vacuum pump or placed in a vacuum system downstream of any pressure generating device. The valve operates by varying an internal orifice depending on line pressure. This variable orifice allows full pumping conductance at pressures below 4 psia, and is fully limiting at pressures above 15 psia. The valve, constructed of austenitic stainless steel and aluminum, employs a fully enclosed diaphragm to establish the actuating pressure differential. To date the valve has been used on five vacuum pumps and, though data are preliminary, pump vibration and oil turbulence have been visually reduced with little adverse effect on pumpdown time. The system was developed to transfer radioactive gases in process operations at Mound Facility.

4208 Electronic Circuits And Devices

26049 (BDX—613-2626) Testing multilayer printed wiring board prepreg by differential-scanning calorimetry. Final report. Scott, D.A.; Lula, J.W. (Bendix Corp., Kansas City, MO (USA)). Jul 1981. Contract AC04-76DP00613. 23p. NTIS, PC A02/MF A01. Order Number DE81025607.

A simplified receiving inspection test for epoxy/glass prepreg was developed. This test, which could replace the resin flow test, uses differential scanning calorimetry to measure the glass transition temperature. The glass transition temperature was found to correlate well with the resin flow test.

26050 (BDX—613-2629) dc sputter gold deposition on beryllium-copper contacts. Hale, G.J. (Bendix Corp., Kansas City, MO (USA)). Jun 1981. Contract AC04-76DP00613. 16p. NTIS, PC A02/MF A01. Order Number DE81025608.

A direct current sputter deposition technique was developed which allowed a current viewing resistor (CVR) contact to meet gold-coating requirements. The 8.8-mm-long beryllium-copper contact required a controlled gold thickness on three areas of its surface, one of which was a blind hole 0.57 mm in diameter and 4.1-mm deep. Special fixturing and three gold deposition runs, one for each critical surface, were needed to achieve the desired results. Results of an evaluation of six contacts randomly chosen from a sample size of 525 showed that this process will produce parts that meet gold-coating specifications.

26051 **(SAND—80-1132) Aging characteristics of the SA1773 ceramic capacitor.** Young, T.J. (Sandia National Labs., Albuquerque, NM (USA)). Jan 1981. Contract AC04-76DP00789. 18p. NTIS, PC A02/MF A01. Order Number DE81024492.

The SA1773 is a 4 μF, 500 V ceramic capacitor, which may be used in applications requiring a continuously applied dc voltage for long periods of time. This report describes preliminary data taken relative to leakage current and capacitance aging characteristics of the SA1773. The range of temperatures, voltages, and times in the preliminary experiments were 75 to 175°C, 500 V to 2500 V, and times to 1811 days. An empirical model is described which allows for the estimation of leakage current as a function of voltage, temperature, and time.

26052 **(UCID—19048) Specifications for the Linear Charge Coupled Device for use in transient recording.** Balch, J.W. (Lawrence Livermore National Lab., CA (USA)). 28 May 1981. Contract W-7405-ENG-48. 36p. NTIS, PC A03/MF A01. Order Number DE81025517.

Specifications are presented for the Linear Charge Coupled Device (LCCD) developed at the Lawrence Livermore National Laboratory for recording data from transients. This device can be used to record electrical signals at sample rates greater than 10^9 samples per second. Both electrical and physical specifications of the device are presented. The bias and drive requirements of the device are presented in tables and in timing diagrams. Typical performance data are tabulated and shown in oscilloscope photos. The physical specifications of the device include plane and cross sectional drawings of its various registers and I/O sections. Enlarged photos of the mask set are shown and all critical dimensions of the active regions are given. Finally, the impurity doping profile used for the transfer channels is shown.

26053 **Resonant mode PIN switch.** Chaffin, R.J. (Sandia National Labs., Albuquerque, NM). Contract AC04-76-DP00789. *Microwave Journal ;* 33-36(Dec 1980).

A new mode of operation of the PIN diode shunt rf switch is described. This mode produces rf switching speeds that are considerably faster than the applied bias pulse rise-time and pulse widths that are considerably shorter than the applied bias pulse width. The basic principle utilizes the fast snap-off action of the PIN diode to shock excite an L-C bias network. The bias is easily adjusted so that rf can flow through the switch for only one half-cycle of this bias circuit ringing. This new mode of operation is important to the development of very fast rise time rf switches for communication and radar systems.

4209 Waste Processing Plants And Equipment

REFER ALSO TO CITATION(S) 25202, 25826, 25831, 25844

26054 (ANL/CNSV-TM—60, pp 81-99) **Shredding for prepared fuel systems.** Hazell, W.J.; Fuller, E.J. (Henningson, Durham and Richardson, Omaha, NE). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

This paper offers descriptions of the various concepts of shredding which are available to process decision makers; and provides public works planners with general guidance on engineering considerations and equipment applications. The conclusion reached in this paper is that shredding of solid waste is a proven concept for size reduction of municipal solid waste for the preparation of refuse derived fuel. The process of shredding does not stand on its own. Shredding is but one step in properly preparing fuel to specifications. The shredding step must be fit into the chosen system configuration to meet the specifications of the energy market and to serve the best interests of the community. This paper is not a detailed engineering analysis of shredders. It is intended to be an introductory document to educate system planners by providing descriptions of proven shredding equipment and by offering general design considerations which will be helpful for preliminary conceptual flow line determinations.

26055 (ANL/CNSV-TM—60, pp 101-116) **Application of trommeling to prepared fuels.** Parker, W.S. (National Center for Resource Recovery, Inc., New Orleans, LA). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Trommels had their origin in the mining and mineral processing industries and have since been adapted for use in solid waste processing. Results indicate they can perform a rough separation of combustible and non-combustible material. Hole size and shape, drum length and diameter, angle of declination, and rotating speed are critical parameters affecting the desired separation. Some testing and analytical studies have been performed; these are summarized. However, much is still to be learned about rotary screen behavior in theory and observed performance. The paper briefly documents the historical use of trommels in solid waste processing, tabulates the facilities using trommels (whether as RDF processors or not), and describes the US Department of Energy (DOE) sponsored study to investigate trommels both analytically and empirically, as they are applied to waste-to-energy systems.

26056 (ANL/CNSV-TM—60, pp 117-129) **Air classification.** Vesilind, P.A.; Peirce, J.J. (Duke Univ., Durham, NC). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The classification of solid particles in an air stream is discussed in terms of theories of separation and applicabilities to the production of refuse derived fuel. Empirical models of air classifier performance are outlined, and theories of separating ideal spheres and non-ideal irregularly shaped objects are presented. The effects of particle concentration, as well as the impacts to the walls of classifiers, are highlighted as limitations to the basic theories of separation. The limited knowledge of the fundamental aspects of air classification and design are seen to indicate future research needs.

26057 (ANL/CNSV-TM—60, pp 165-208) **Raytheon Service Company experience and programs in resource recovery.** Schroeder, R.L.; Cambourelis, P.J.; Fabuss, B.M.; Peritz, L.A.; Spencer, D.B.; Daniels, J.A.; Stinson, C.A. (Raytheon Service Co., Burlington, MS). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The background of the Raytheon Company in described briefly. Their entry into the resource recovery business is summarized. The projects in which they are involved encompass the following: solid waste and co-disposal of solid waste with sewage sludge; RDF combustion in utility and industrial boilers; use of RDF for steam distribution, electricity and co-generation; and refuse derived fuel production combined with recovery of metals and mineral resources. Mass burning of unprepared solid waste is compared with spreader stoker firing of prepared fuel. The spreader stokers have a higher thermal efficiency, are responsive to steam demand, have less corrosion, and are less subject to overheating. Basic information is presented on each of the major resource recovery projects with which Raytheon is involved. These include: the Monroe County Resource Recovery Facility; the Delaware Reclamation Project; and the Haverhill/Lawrence Resource Recovery Project. Process concepts, descriptions, cost, and operations of each project are covered. (DMC)

26058 (ANL/CNSV-TM—60, pp 285-317) **Economical and reliable disposal and solid waste by Combustion Engineering, Inc, the domestic supplier of energy systems worldwide.** Cunningham, J.A.; Hazzard, N.D.; Smith, M.L. (Combustion Engineering, Inc., Windsor, CT). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Combustion Engineering, Inc., known worldwide as The Energy Systems Company, has been a supplier of major equipment to public and private utilities and large industrial energy users for over 65 years. Over 40 percent of the thermal electric energy generated in the Free World today is developed by steam generators designed or supplied by C-E. C-E's experience in the combustion of a variety of waste fuels extends back to the early 1930's. The C-E

resource recovery system is predicated on using simple preparation steps and efficient burning of the refuse fuel in C-E's versatile semi-suspension fired industrial type boilers. These boilers, an industry standard for over 40 years, fire the prepared refuse with approximately 50 percent burning above a traveling grate and the remainder in a thin bed on the grate insuring efficient and complete combustion. The preparation steps include flail shredding for bag opening, magnetic separation of ferrous metals, separation of sand, glass and dirt by screening and fuel size reduction to six inches top size. The state of the art has shown that the principal problems in prepared fuel operations have been external to the boiler. C-E's simplified approach to processing permits projects to enjoy the benefits of higher reliability and availability in the energy conversion system which means lower tipping fees for project participants.

26059 (ANL/CNSV-TM—60, pp 391-402) **Considerations affecting dedicated boiler design for refuse-derived fuels (RDF).** Sommerlad, R.E. (Foster Wheeler Development Corp., Livingston, NJ); Adams, P.J.; Hollander, H.I. Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

This paper highlights the considerations affecting the design of a dedicated boiler for refuse-derived fuel (RDF). The topics covered include fuel parameters, fuel mix, capacity, control, design concepts, and influence of size on design. There is vast experience with fuels similar to RDF to aid the designer, and examples are presented. Freedom of design is shown to be necessary if RDF by itself or in combination with other waste or fossil fuels is to be utilized successfully.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 24967, 25189, 25443, 25445, 25769

26060 **(DOE/ET/10381—150) Industrial application of fluidized-bed combustion. Quarterly technical progress report, October-December, 1980.** (Georgetown Univ., Washington, DC (USA)). 1980. Contract AC21-76ET10381. 91p. NTIS, PC A05/MF A01.

In line with a determination by the Federal Government that a fluidized bed combustion process can efficiently convert the energy of coal to usable power in an environmentally acceptable manner, Georgetown University was awarded a contract by the Department of Energy to construct and operate a demonstration plant. This report, which is the seventeenth quarterly progress report under the contract, reflects the progress made during the fourth full quarter of plant operation.

26061 **(PB—81-105934) Capital and operating costs for industrial boilers. Final report Apr-Jun 79.** Gibbs, L.L.; AbrahaM, J.P.; Noe, N.D.; Forste, D.S.; Kimball, H.T. (PEDCo-Environmental, Inc., Cincinnati, OH (USA)). Jun 1979. Contract EPA-68-02-3074. 271p. NTIS, PC A12/MF A01.

The report provides estimates of capital and operating costs for industrial boilers. Costs are related to the type of fuel fired, firing design and rated capacity. Both package and field-erected boilers are evaluated. Fuels considered include coal, residual oil, distillate oil and natural gas. Firing designs for coal include underfeed-stoker, spreader-stoker and pulverized. Rated capacities range from 15(10 to the 6th)Btu/hr for oil and gas to 700(10 to the 6th)Btu/hr for coal. Costs are developed on a study estimate basis. Individual boiler cost estimates were plotted and cost equations developed for total equipment, installation (direct and indirect) and operating costs (variable and fixed).

4220 Underground Engineering

REFER ALSO TO CITATION(S) 26029

26062 **(SAND—81-0050C) TOODY-WONDY calculations of penetration events.** Hicks, D.L.; Norwood, F.R.; Trucano, T.G. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 4p. (CONF-810684—7). NTIS, PC A02/MF A01. Order Number DE81023680.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

One- and two-dimensional Lagrangian wavecode calculations simulating penetration of a conical-nosed steel penetrator into Antelope Lake Tuff are summarized. These calculations are used to investigate the validity of the cylindrical cavity expansion theory, which has been used to simplify the analysis of earth-penetration events.

4240 Pollution Control Equipment

REFER ALSO TO CITATION(S) 25444, 26162

26063 **(CONF-800608—7) Status of pollution-control technologies for industrial boilers.** Streets, D.G.; Weisenberg, I.J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 15p. NTIS, PC A02/MF A01.

From Air Pollution Control Association annual meeting; Montreal, Canada (Jun 1980).

A brief status report on particulate, SO_2 and NO/sub x/ control technology for industrial boilers is presented. While there are many techniques that are either in the laboratory, experimental or pilot plant stages, there are relatively few that can presently be considered adequately demonstrated. There are also fewer techniques that combine particulate, SO_2 and NO/sub x/ control in one system that have been proven operationally on a full-scale basis over a reasonable period of time.

4250 Power Cycles

REFER ALSO TO CITATION(S) 26624, 26624

43 PARTICLE ACCELERATORS

4301 Design, Development, And Operation

REFER ALSO TO CITATION(S) 26668, 26685

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 26075

26064 **(CONF-8006123—3) Argonne tandem as injector to a superconducting linac.** Yntema, J.L.; Den Hartog, P.K.; Henning, W.; Kutschera, W. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 20p. NTIS, PC A02/MF A01. Order Number DE81023521.

From 5. tandem conference; Catania, Italy (9 Jun 1980).

The Argonne Tandem uses Pelletron chains, NEC accelerator tubes, and a dual closed-corona system. Its main function is to be an injector for a superconducting linear accelerator. As long as the transverse and longitudinal emittances are within the acceptance of the linac, the output beam quality of the tandem-linac system is essentially determined by the tandem. The sensitivity of the linac to the longitudinal emittance $\Delta E \Delta t$ of the incident beam makes the output beam quality dependent on the negative-ion velocity distribution in the source, transit-time effects in the tandem, molecular-beam dissociation, and stripper-foil uniformity. This paper discusses these beam-degrading effects.

26065 **Limiting currents in shielded source configurations.** Genoni, T.C.; Miller, R.B. (Air Force Weapons Laboratory, Kirtland Air Force Base, New Mexico 87117). *Physics of Fluids ;* **24**: No. 7, 1397-1398(Jul 1981).

Limiting currents for laminar flow equilibria of relativistic electron beams in shielded source configurations are discussed. Results are presented for the constant applied magnetic field case, and for the case of constant beam radius.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 25175

26066 (BNL—29588) Accelerator spallation reactors for breeding of fissile fuel and transmuting fission products. Steinberg, M. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 44p. (CONF-810580—1). NTIS, PC A03/MF A01.

From Prospective on adaptive nuclear energy evolutions: towards a world of neutron abundance conference; Laxenberg, Austria (25 May 1981).

This report constitutes a summary review of the status and prospects of the development of accelerator spallation reactors for breeding fissile fuel and for transmuting fission products.

26067 (CONF-800980—39) Six tesla analyzing magnet for heavy-ion beam transport. Smith, R.P.; Bollinger, L.; Erskine, J.; Genens, L.; Hoffman, J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 4p. NTIS, PC A02/MF A01. Order Number DE81023922.

From Applied superconductivity conference; Santa Fe, NM, USA (29 Sep 1980).

A superconducting analyzer magnet for particle beam deflection has been designed and is being fabricated for use at the Argonne Tandem-Linac Accelerator System (ATLAS). This six tesla magnet will provide 45° of deflection for the heavy-ion beams from the ATLAS tandem electrostatic accelerator and together with its twin will replace the existing conventional 90° analyzer magnet which will become inadequate when ATLAS is completed.

26068 (CONF-800980—42) Superconducting compensator magnets to be used with the HRS spectrometer at the SLAC PEP facility. Hyman, L.G.; Sheppard, J.F.; Smith, R.F. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 4p. NTIS, PC A02/MF A01. Order Number DE81023899.

From Applied superconductivity conference; Santa Fe, NM, USA (29 Sep 1980).

The first of a pair of identical superconducting compensator solenoids required for the High Resolution Spectrometer Facility (HRS) at the Stanford e^+e^- Colliding Beam Storage Ring Accelerator (PEP) has been tested. The magnet provides a 2.0 T field in a room temperature bore 19.0 cm in diameter. The magnet winding length is 1.65 m and a cold iron yoke reduces the fringe fields 30 cm outside the cryostat to less than 10 gauss. The pool-boiling helium cryostat with liquid nitrogen cooled thermal radiation shield will be supplied with cryogens from the Spectrometer Facility refrigeration system.

26069 (CONF-801111—46) Carbon stripper foils for heavy-ion accelerators. Thomas, G.E. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023802.

From 6. conference on application of accelerators in research and industry; Denton, TX, USA (Nov 1980).

Carbon stripper foils have for many years been successfully used with accelerators because they yield higher average charge states than gas strippers. However, with the development of heavy ion accelerators and the resulting use of heavier ions, the carbon stripper foil lifetimes are greatly reduced. Even when using the new foils changer systems, which typically contain two hundred foils or more, it becomes necessary to have frequent accelerator shutdowns for foil reloading. The rate of experiment interruption makes it clear a new approach is necessary to increase foil lifetimes. Several techniques have been tried with varying degrees of success to strengthen these foils so that they will last longer; the most successful one reported a lifetime increase of the order of a factor of 30 over foils produced in the conventional manner. Methods of producing various types of foils will be presented, a discussion will be given on theories for foil breakage, and some new ideas will be introduced for further increasing foil lifetimes.

26070 (CONF-8006123—2) Accelerator mass spectrometry and radioisotope detection at the Argonne FN tandem facility. Henning, W.; Kutschera, W.; Paul, M.; Smither, R.K.; Stephenson, E.J.; Yntema, J.L. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 63p. NTIS, PC A04/MF A01. Order Number DE81023522.

From 5. tandem conference; Catania, Italy (9 Jun 1980).

The Argonne FN tandem accelerator and standard components of its experimental heavy-ion research facility, have been used as a highly-sensitive mass spectrometer to detect several long-lived radioisotopes and measure their concentration by counting of accelerated ions. Background beams from isobaric nuclei have been eliminated by combining the dispersion from the energy loss in a uniform Al foil stack with the momentum resolution of an Enge split-pole magnetic spectrograph. Radioisotope concentrations in the following ranges have been measured: $^{14}C/^{12}C = 10^{-12}$ to 10^{-13}, $^{26}Al/^{27}Al = 10^{-10}$ to 10^{-12}, $^{32}Si/Si = 10^{-8}$ to 10^{-14}, $^{36}Cl/Cl = 10^{-10}$ to 10^{-11}. Particular emphasis was put on exploring to what extent the technique of identifying and counting individual ions in an accelerator beam can be conveniently used to determine nuclear quantities of interest when their measurement involves very low radioisotope concentrations. The usefulness of this method can be demonstrated by measuring the $^{26}Mg(p,n)^{26}Al(7.2 \times 10^5$ yr) cross section at proton energies in the astrophysically interesting range just above threshold, and by determining the previously poorly known half life of ^{32}Si.

26071 (LBL—12797) Mass spectrometry with a very small cyclotron. Muller, R.A.; Tans, P.P.; Mast, T.S.; Welch, J.J. (Lawrence Berkeley Lab., CA (USA)). May 1981. Contract W-7405-ENG-48. 6p. (CONF-810586—1). NTIS, PC A02/MF A01. Order Number DE81023050.

From Argonne symposium on high energy spectrometry; Argonne, IL, USA (11 May 1981).

It is proposed that direct detection of natural radioisotopes can be accomplished by using a very low energy (20 to 100 keV) cyclotron accelerating negative ions.

26072 (SAND—81-0844C) Characterization of an accelerator designed to study electron-beam uniformity in large diodes. Patterson, E.L.; Hamil, R.A.; Ramirez, J.J. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 16p. (CONF-810659—2). NTIS, PC A02/MF A01.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

Results are described of initial tests on an accelerator (RAYITO) designed to investigate electron-beam control and uniform excitation of large volume lasers. For these tests the accelerator is operated in the 50 nsec mode with diode voltages and currents up to 1 MV and 500 kA. The cathode emitting surface is a 30 cm x 105 cm carbon-felt material. The diode is immersed in a nearly axial applied magnetic field variable from 0 to 3.7 kG. The spatial distribution of current is monitored by time-resolved photography of Cherenkov radiation emitted by a dielectric converter plate placed perpendicular to the beam propagation direction. Diode performance is monitored as a function of the magnitude of the applied magnetic field.

26073 Wiggler and undulator magnets. Winick, H.; Brown, G.; Halbach, K.; Harris, J. (Stanford Synchrotron Radiation Laboratory). *Physics Today ;* **34**: No. 5, 50-63(May 1981).

Two new devices are being added to synchrotron radiation sources to extend the spectral range and increase brightness.

26074 Some comments on superhigh energy antiproton-proton colliders. Cline, D.B. (Fermilab, Batavia, IL). pp 14p, Paper 20 of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

The possible construction of very high energy anti pp colliders is discussed. These machines will profit from high luminosity

and will likely require a new generation of high intensity antiproton sources. One such possible source is outlined here.

4304 Storage Rings

26075 (DOE/CH/03000—T3) Final beam emittances at the end of anti P-accumulation for the Fermilab anti P source. Takayama, K.; Ruggiero, A.G. (Fermi National Accelerator Lab., Batavia, IL (USA)). Apr 1981. Contract AC02-76CH03000. 21p. NTIS, PC A02/MF A01. Order Number DE81024925.

The behavior of an individual particle in the emittance space is discussed and the evolution equations are derived for beam emittances. Numerical methods to solve non-linear evolution equations are exposed, and the equilibrium emittances and the relaxation times, that is the times it takes for the anti p beam to reach the equilibrium, for different ring parameters.

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 24873, 26101, 26609, 26638

26076 (CONF-801103—59) Enhancement of a radiation safety system through the use of a microprocessor-controlled speech synthesizer. Keefe, D.J.; McDowell, W.P. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023825.

From IEEE nuclear science symposium; Orlando, FL, USA (5 Nov 1980).

A speech synthesizer is being used to differentiate eight separate safety alarms on a high energy accelerator at Argonne National Laboratory. A single board microcomputer monitors eight signals from an existing radiation safety logic circuit. The microcomputer is programmed to output the proper code at the proper time and sequence to a speech synthesizer which supplies the audio input to a local public address system. This eliminates the requirement for eight different alarm tones and the personnel training required to differentiate among them. A twenty-word vocabulary was found adequate to supply the necessary safety announcements. The article describes the techniques used to interface the speech synthesizer into the existing safety logic circuit.

26077 (FERMILAB-Conf—81/40-EXP) Use of the ECL-CAMAC trigger processor system for recoil missing mass triggers at the Tagged Photon Spectrometer at Fermilab. Martin, J.; Bracker, S.; Hartner, G.; Appel, J.; Nash, T. (Toronto Univ., Ontario (Canada); Fermi National Accelerator Lab., Batavia, IL (USA)). May 1981. Contract AC02-76CH03000. 16p. (CONF-810539—4). NTIS, PC A02/MF A01.

From Conference on the application of microprocessors to high energy physics experiments; Geneva, Switzerland (4 May 1981).

A trigger processor in operation since May 1980 at the Tagged Photon Spectrometer at Fermilab will be described. The processor, based on the Fermilab ECL-CAMAC system, allows fast selection of high mass diffractive events from the total hadronic cross section. Data from a recoil detector, consisting of 3 wire chambers and 4 layers of scintillator concentric about a 1.5 m liquid hydrogen target, is digitized and presented to the processor within 3 sec. From the chamber data are found the vertices and angles of all recoiling tracks.

26078 (LA—8814-MS) Remote detection system. Nixon, K.V.; France, S.W.; Garcia, C.; Hastings, R.D. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 12p. NTIS, PC A02/MF A01. Order Number DE81024054.

A newly designed remote detection system has been developed at Los Alamos that allows the collection of high-resolution gamma-ray spectra and neutron data from a remote location. The system consists of the remote unit and a command unit. The remote unit collects data in a potentially hostile environment while the operator controls the unit by either radio or wire link from a safe position. Both units are battery powered and are housed in metal carrying cases.

26079 (LBL—12380) Status and problems of semiconductor detectors. Walton, J.T.; Goulding, F.S.; Haller, E.E.; Pehl, R.H. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 32p. (CONF-810351—2). NTIS, PC A03/MF A01.

From INS meeting on nuclear radiation detectors; Tokyo, Japan (23 Mar 1981).

A brief review is given of the types of silicon and germanium detectors used or presently being developed for nuclear experiments. Large-area silicon and germanium detector telescopes for use in long-range particle detection and identification are emphasized. Large area position-sensitive detectors are also described. Some results are presented regarding radiation damage and damage repair by annealing. Evidence is also presented for the importance of producing large area silicon crystals of adequate quality to reduce trapping problems to negligible proportions.

26080 (NUREG/CR—1668) Advanced mobile multi-processor gamma-ray acquisition and analysis system. Topical report. Killian, E.W.; Morneau, R.A. (Idaho National Engineering Lab., Idaho Falls (USA)). Sep 1980. 114p. NTIS, PC A06/MF A01.

The report describes a new Gamma-Ray Acquisition and Analysis system which has been developed for the In-Plant Source Term Measurement Program. A new computer was added to the system described previously in Reference 5, 'Procedures, Source Term Measurement Program,' NUREG-0384. One computer is now used to acquire the data and the other (new computer) is used to analyze the resulting data. The throughput of the system has been dramatically improved. Data analysis times have been reduced by about a factor of 10. Moreover, the analysis procedure is much more complex and provides results which can be directly reported with minimal operator interpretation. The information contained in this report supersedes the description of the analysis package given in Appendix B of the procedures manual (NUREG-0384).

26081 (ORNL—5758) Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980. Sadowski, G.S. (comp.). (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 310p. NTIS, PC A14/MF A01. Order Number DE81024412.

Brief summaries of research work are presented in the following section: overview of the ORNL Instrumentation and Controls Division activities; new developments and methods; reactor instrumentation and controls; measurement and control engineering; electronic engineering; maintenance; studies; services; and development; and division achievements.

26082 (SLAC-TN—81-2) Two Word CAMAC I/O module. Barker, L.L. (Stanford Linear Accelerator Center, CA (USA)). May 1981. Contract AC03-76SF00515. 3p. NTIS, PC A02/MF A01.

This note describes the 2 Word I/O subsystem and details its operating characteristics. SLAC drawings in the 926-306 series support this device and should be referenced for construction and connection details.

26083 (UCRL—85604) Radiation-to-light converters for nuclear environments: near-infrared emitters. Roeske, F.; Rotter, M.D.; Calavan, P.M.; Lutz, S.S. (Lawrence Livermore National Lab., CA (USA); EG and G, Inc., Goleta, CA (USA)). 4 May 1981. Contract W-7405-ENG-48. 9p. (CONF-810810—4). NTIS, PC A02/MF A01. Order Number DE81023155.

From SPIE international symposium; San Diego, CA, USA (24 Aug 1981).

The use of fiber optics in the diagnosis of hostile nuclear environments has brought about a pressing need for the development of suitable radiation-to-light converters. These converters must meet stringent diagnostic requirements of linearity and time re-

sponse while having a wavelength of emission that is compatible with transmission over relatively long lengths of optical fibers. Initial investigations of two, near-infrared-emitting semiconducting materials - CdTe and GaAs are described. Data are presented on the wavelength of emission, linearity, time response, and relative efficiency of these semiconductors. Most data were taken at 77 K because of a dramatic increase in efficiency at this temperature. Measurments show that the intensity-vs-dose curves are linear over several decades of useful input levels. Measurements indicate that GaAs has an efficiency and time response that promise to be useful in diagnostic systems.

26084 **Lyoluminescent dosimetric materials and their response to ionizing radiation.** Ettinger, K.V.; Fairchild, R.G. (Brookhaven National Lab., Upton, NY (USA). Medical Dept.); Anunuso, C.J.; Srirath, S.; Del Vigna Filho, E. (Aberdeen Univ. (UK). Dept. of Biomedical Physics and Bioengineering). *Nuclear Instruments amp Methods ;* **175**: No. 1, 119-121(Sep 1980).

From 6. international conference on solid state dosimetry; Toulouse, France (1 - 4 Apr 1980).

A survey of known lyoluminescent phosphors suitable for use in radiation dosimetry is provided, giving information on the sensitivity, range of doses which can be measured and on the factors affecting reproducibility. A brief description of the application of sensitizers is also given.

26085 **Applications of lyoluminescence.** Ettinger, K.V. (Brookhaven National Lab., Upton, NY (USA). Medical Dept.); Mallard, J.R.; Anunuso, C.I.; Del Vigna Filho, E.; Regan, C.; Srirath, S. (Aberdeen Univ. (UK). Dept. of Biomedical Physics and Bioengineering). *Nuclear Instruments amp Methods ;* **175**: No. 1, 136-138(Sep 1980).

From 6. international conference on solid state dosimetry; Toulouse, France (1 - 4 Apr 1980).

Dosimetry systems based on lyoluminescence have been tried in two dose ranges: 0.1-20 Gy for radiotherapy and 10 Gy-80 kGy for radiation processing of food and sterilization of materia medica. Lyoluminescence can also be used for the measurement of the radical scavenging activity of chemical compounds, particularly those with potential for use as radioprotective agents.

26086 **Results from TASSO.** Wu, S.L. (Univ. of Wisconsin, Madison). pp 37p, Paper 6 of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

Recent results of the TASSO Collaboration at PETRA are reported in detail, and the highlights of the experimental data from the PLUTO and JADE Collaborations are summarized.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

REFER ALSO TO CITATION(S) 26100

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 25471, 25537, 25906, 26415, 26724

26087 **(DOE/TIC—1023186) Measurement of peak temperature along an optical fiber.** Fox, R.J. (Oak Ridge National Lab., TN (USA)). 29 May 1981. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE81023186.

The inherent immunity of optical fibers to interference from electric and magnetic fields has spurred the development of fiber optic sensors to aid in monitoring the operating parameters of electrical power generation equipment. This approach is particularly attractive for the measurement of hot spots in large, high-voltage transformers where high electric fields preclude the use of metallic lead wires to join remote readout equipment to the thermocouple or thermistor sensors. There is the further possibility of using a length of fiber to determine remotely the maximum temperature achieved at any point along the fiber's length, i.e., a distributed (line) sensor. A common limitation of previously proposed designs for line sensors is an inability to distinguish between a long warm region and a short hot zone. The design and operation of a fiber optic line sensor that overcomes this limitation is described. (LCL)

26088 **(SAND—80-2689C) Transient temperature response of strain gages.** Adams, P.H. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 14p. (CONF-810807—1). NTIS, PC A02/MF A01.

From BSSM-SESA international conference; Edinburgh, UK (31 Aug 1981).

When an electrical resistance strain gage bonded to a material is subjected to a temperature change, the resistance of the strain gage changes even though the material is free of stress. This temperature-induced resistance change is generally expressed in strain units and is commonly called apparent strain or thermal output. The thermal expansion coefficients and the temperature coefficient of resistance are temperature-dependent quantities and not necessarily linearly related to temperature. For transient temperature conditions, the two temperatures are different. The magnitude and effect of this temperature difference on apparent strain is studied. (WHK)

26089 **(SAND—81-0650C) Direct bandgap, ionizing radiation insensitive photodiode structures.** Wiczer, J.J.; Dawson, L.R.; Osbourn, G.C.; Barnes, C.E. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 4p. (CONF-810810—1). NTIS, PC A02/MF A01.

From SPIE international symposium; San Diego, CA, USA (24 Aug 1981).

This brief paper reports on photodiode structures designed and fabricated to reduce unwanted ionizing-radiation induced noise currents without significantly reducing the optical signal currents and compares testing results with commercial photodiodes.

26090 **(SLAC-PUB—2738) FASTBUS introduction and demonstration.** Logg, C.A.; Paffrath, L.; Bertolucci, B.; Horelick, D. (Stanford Linear Accelerator Center, CA (USA)). May 1981. Contract AC03-76SF00515. 7p. (CONF-810523—7). NTIS, PC A02/MF A01. Order Number DE81024419.

From Topical conference on computerized data acquisition in particle and nuclear physics; Oak Ridge, TN, USA (28 May 1981).

This poster session paper presents a simplified explanation of the FASTBUS communication protocol and a brief description of the FASTBUS modules and the FASTBUS Operating System (FBOS) being used in the current prototyping efforts at SLAC. A sample session utilizing the FBOS to initialize and exercise a FASTBUS segment is also presented.

26091 **(UCRL—85655) Psuedo-3D, isodensity and density profiles from fiber optic output of a MACH-130 air shock.** Dittmore, C.H.; Glenn, H.D. (Lawrence Livermore National Lab., CA (USA)). 5 Jun 1981. Contract W-7405-ENG-48. 9p. (CONF-810810—2). NTIS, PC A02/MF A01. Order Number DE81023059.

From SPIE international symposium; San Diego, CA, USA (24 Aug 1981).

A modified Voitenko compressor generated a Mach-130 air shock in an outlet pipe open to the atmosphere. Fiber optics transmitted luminosity associated with propagation of the air shock to an external display board, which was scanned with a high-speed streaking camera. We describe the computerized microdensitometer scanning technique for converting the film records to pseudo-3D, isodensity, and density profiles. The isodensity contours can be displayed using different colors to facilitate analysis. This technique can achieve resolutions of 1 ns and 2 μm. We give examples of the pseudo-3D, isodensity, and density profile plots for the experiment. The microdensitometer output was digitized for input to data display programs run on a CDC 7600. These results were used to provide submicrosecond accuracy for shock propagation over a 5 m of the outlet pipes. In addition, we obtained information about gas flow behind the shock front. Other current or possible applications

for the technique are measurement of: target implosion in laser fusion, flash x-ray data in hydrodynamic and ballistic experiments, temperature profiles for high energy (> 10^5 K) gas dynamics, and dynamic events in weapons testing.

26092 (UCRL—86285) Calibration of peizoresistive gauges. Nutt, G.L.; Hallquist, J.O. (Lawrence Livermore National Lab., CA (USA)). 15 Jun 1981. Contract W-7405-ENG-48. 5p. (CONF-810684—18). NTIS, PC A02/MF A01. Order Number DE81024193.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

The dynamic response of two ytterbium gauges is modeled using the two-dimensional Lagrangian finite difference code on DYNA2D. The gauges are embedded in a medium of PMMA. The stress and strain state of each element of the gauge is then used to calculate the resistance change as a function of time. The ratio of the calculated transverse to normal signals is 0.58, in excellent agreement with measurements. (DLC)

26093 Research with x rays. Sparks, C.J. Jr. (Metals and Ceramics Division of Oak Ridge National Laboratory, Oak Ridge, Tennessee). W-7405-ENG-26. *Physics Today ;* **34**: No. 5, 40-49(May 1981).

No longer limited by weak x-ray sources, researchers are using intense beams of synchrotron radiation, continuously selectable in energy, to explore the geometric and electronic structure of matter.

26094 Lightpipe luminoscope for monitoring occupational skin contamination. Vo-Dinh, T.; Gammage, R.B. (Oak Ridge National Lab., TN). *American Industrial Hygiene Association Journal ;* **42**: No. 2, 112-120(Feb 1981).

A portable luminescence detector has been constructed for monitoring occupational skin contamination. The instrument design is based upon a fiberoptics bifurcated lightguide which transmits the ultraviolet excitation light to the skin area being monitored and conducts the induced fluorescence to the photon-counting detector. The performance of the instrument has been evaluated in the laboratory and field-tested at a coal conversion facility. Preliminary results indicate that coal distillates and recycled solvents from liquefaction processes can be detected at a few $\mu L/cm^2$ levels.

26095 Luminescence monitoring of oil or tar contamination for industrial hygiene. Gammage, R.B.; Vo-Dinh, T. (Oak Ridge National Lab., TN (USA). Health and Safety Research Div.). *Nuclear Instruments amp Methods ;* **175**: No. 1, 236-238(Sep 1980).

From 6. international conference on solid state dosimetry; Toulouse, France (1 - 4 Apr 1980).

Synfuel plants produce potentially carcinogenic oils and tars. Exposure of workers to these tars and oils is difficult to avoid completely and occurs via direct contact with dirty surfaces or condensation of escaped fumes onto or within the body. Surface skin measurements are made directly with a near-ultraviolet luminoscope employing a fiber optics lightguide and a stethoscopic cap pressed against the skin. This instrument is especially suitable for measuring ng to $\mu g/cm^2$ amounts of residual contamination remaining on the surface of the skin after washing. To minimize the potential for carcinogenicity, the excitatory ultraviolet light intensity is only 1/100th that of sunlight.

4404 Well Logging Instrumentation

26096 (LBL—12076, pp 3-10) **Role of well testing in civil engineering.** Banks, D. (US Army Engineer Waterways Experiment Station, Vicksburg, MS). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

Purpose of well testing is to derive a value of the permeability of the geologic medium or to measure the velocity or quantity of fluid flow. The types of tests typically employed on civil engineering projects are simple borehole tests, packer or pressure tests in boreholes, permeameter tests, well pumping tests, and in-hole tests using well flow meters or tracer tests. New problem areas which demand new approaches are mentioned. (DLC)

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

26097 (MHSMP—81-28) Study for compacting the explosive LX-17. Harrell, J.D. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Jun 1981. Contract AC04-76DP00487. 8p. NTIS, PC A02/MF A01.

The effects of compaction process variables on the pressed density of LX-17 were determined. The variables evaluated were pressure, number of compaction cycles and dwell time. Density was influenced to the greatest degree by the number of compaction cycles. A maximum of five cycles was studied. Smaller but significant increases in densities were achieved in raising the pressure from 140 MPa to 196 MPa and increasing the dwell time from 15 minutes to 240 min. Two lots of L-17 containing different TATB particle size distributions were evaluated. Both lots contained TATB meeting the current particle size specification. Significant differences in pressed densities were observed between these two LX-17 lots.

26098 (MHSMP—81-29) Computer program for storage and retrieval of thermal-stability data for explosives. Ashcraft, R.W. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Jun 1981. Contract AC04-76DP00487. 19p. NTIS, PC A02/MF A01. Order Number DE81024410.

A computer program for storage and retrieval of thermal stability data has been written in HP Basic for the HP-9845 system. The data library is stored on a 9885 flexible disk. A program listing and sample outputs are included as appendices.

26099 (UCRL—85187) Comparison of molecular-dynamics calculations with observed initiation phenomena. Walker, F.E.; Karo, A.M.; Hardy, J.R. (Lawrence Livermore National Lab., CA (USA); Nebraska Univ., Lincoln (USA). Behlen Lab. of Physics). 5 Jun 1981. Contract W-7405-ENG-48. 48p. (CONF-810602—28). NTIS, PC A03/MF A01. Order Number DE81024713.

From 7. symposium on detonation; Annapolis, MD, USA (19 Jun 1981).

A large number of molecular dynamics calculations of the effects of the interaction of shock waves with condensed systems representing chemical explosives have been completed and the microscopic effects of material characteristics known to cause changes in the sensitivity of explosives - voids and cracks, crystal defects, inclusions, initial temperature, and shock strength were explored. An instructive correlation with the macroscopic results was seen. In studies of voids in model two-dimensional diatomic systems, such as face-centered cubic nitric oxide and sulfur nitride lattices impacted by aluminum plates, the qualitative behavior was found to be much the same, whether the system is initially quiescent or thermal. Much experimental evidence shows that chemical bonds can be broken by strictly mechanical forces to form free radicals, and the calculations indicate that a similar process can occur in condensed explosives within a shock front. This process is not in thermal equilibrium nor does it obey the rules of statistical mechanics.

4502 Nuclear

REFER ALSO TO CITATION(S) 26620

26100 (AD—460281) Evaluation of military radiac equipment. Cohen, A.E.; Jachter, M.H.; Murphy, H.M. Jr. (Army Electronics Labs., Fort Monmouth, NJ (USA)). 28 Feb 1958. 60p. NTIS, PC A04/MF A01.

The objective of this project was to evaluate under operational conditions in a contaminated area: (1) new and untested radiac instruments, as well as older types which had not been fully evaluated; and (2) dosimeters, including the new Army Chemical Corps chemical dosimeter. Dosimeters were evaluated in both the

initial-and the residual radiation fields encountered in nuclear detonations. National Bureau of Standards-type photographic dosimeters were used as comparison standards for the initial-radiation tests, while Victoreen r-Meters were used as comparison standards for the residual-field tests.

26101 (AD—464381) Initial neutron and gamma air-earth interface measurements. Final report. York, E.N.; Boyd, R.E.; Blaylock, J.A. (Air Force Special Weapons Center, Kirtland AFB, NM (USA)). 23 Feb 1960. 70p. NTIS, PC A04/MF A01.

Measurements of total gamma dose, gamma dose rate, neutron flux, and neutron dose were made at the surface and at heights up to 950 feet to determine the effect of the air-ground interface on initial nuclear radiation. Measurements of total gamma dose and neutron flux were made with dosimeters fastened to towers 500 feet high and to the mooring cables of captive balloons 950 ft high. Total gamma measurements were made with three types of film badges, two types of phosphate glass dosimeters, quartz-fiber dosimeters, and chemical dosimeters. Neutron-flux measurements were made with sulfur pellets and with nuclear track emulsions. Neutron-dose measurements were made with chemical dosimeters. Measurements of gamma dose rate were made with air-filled, saturated, ion-chamber detectors carried by captive balloons with signals carried by miniature coaxial cable to ground stations and recorded on magnetic tape. It was found that total gamma dose increased with height to a value, at 400 ft, 30% greater than ground measurements. There was no further increase up to 950 ft. The effect was the same at all stations from 1,500 to 3,500 yards horizontal distance from burst point. There was no change in the ratio of gamma dose rates at the balloon stations compared to dose rates at ground stations over the first 5-second interval for which records were obtained.

26102 (UCID—19031) Why you see what you see looking down at an underground explosion. Nordyke, M. (Lawrence Livermore National Lab., CA (USA)). 5 May 1981. Contract W-7405-ENG-48. 14p. NTIS, PC A02/MF A01. Order Number DE81025887.

The possibility of using computerized analyses of aerial images of the ground zero area to construct a three-dimensional quantitative picture of the spall and slapdown process resulting from contained nuclear explosions is discussed. It may then be possible to utilize this three-dimensonal picture of the surface motion to construct a model of the underlying geological structure in a manner analogous to refraction profiling. In such a manner, this data resource may prove to be of great value for dealing with these problems.

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

26103 Lagrangian and Eulerian time-scale relations in the daytime boundary layer. Hanna, S.R. (Air Resources, Atmospheric Turbulence and Diffusion Laboratory, NOAA, Oak Ridge, TN 37830). *Journal of Applied Meteorology ;* **20**: No. 3, 242-249(Mar 1981).

Lagrangian (neutral balloon) and Eulerian (tower and aircraft) turbulence observations were made in the daytime mixed layer near Boulder, Colorado. Average sampling time was ~25 min. Average Lagrangian time scale is ~70 s and average ratio of Lagrangian to Eulerian time scales (β = T/sub L//T/sub E/) is about 1.7. The ratio β is inversely proportional to turbulence intensity i. These data support the formula $\beta = 0.7/i$. Lagrangian time scale for the vertical component of turbulence at heights above ~100 m is given by the formula T/sub L/ = 0.17z/sub i//σ/sub w/, where z/sub i/ is mixing depth. This formula is valid for the horizontal components of turbulence at all heights in the mixed layer. Lagrangian specta in the inertial subrange are best represented by the formula F/sub r/(n) = $0.2\epsilon n^{-2}$.

5001 Basic Studies

REFER ALSO TO CITATION(S) 25226, 25294, 26148, 26165, 26207

26104 (BNL—51385) Description of the turbulent fragmentation of a puff in the turbulent flow with the large Reynold's numbers. Levin, A. (Brookhaven National Lab., Upton, NY (USA)). Mar 1981. Contract AC02-76CH00016. 18p. NTIS, PC A02/MF A01. Order Number DE81023870.

This report is devoted to the analysis and description of the turbulent diffusion of a puff, concerning the selectively fine structure of the distribution of the contaminant inside such a puff. This analysis can be useful for considering the process of fast, turbulent-diffusion-controlled chemical reaction of the puff of contaminant with the surrounding chemically-active medium.

26105 (BNL—51386) Remarks on the description of the statistical features of the turbulent diffusion of a puff. Levin, A. (Brookhaven National Lab., Upton, NY (USA)). Mar 1981. Contract AC02-76CH00016. 22p. NTIS, PC A02/MF A01. Order Number DE81023857.

The process of turbulent diffusion of a puff is treated statistically through the application of Markovian random processes. A theoretical model of the fluctuations of the sizes of puffs in the inertial and outer subranges of turbulence is developed. This model is applied to explain two physical effects of turbulent diffusion. The first is the statistical distribution of the concentration of contaminants, which is often found to be close to a lognormal distribution and the second is the growth with time of the vertical diameter of a puff in the outer subrange, which has been observed to be close to linear.

26106 (PB—81-114969) Controlling airborne particles. (National Research Council, Washington, DC (USA)). Apr 1980. Contract EPA-68-02-2890. 136p. NTIS PC MF A01.

This report describes current knowledge about ambient concentrations of particles in the air, their sources, and techniques for their control. Its purpose is to assess the availability of technology for protecting the population from potentially harmful exposures. The contents are as follows: Introduction; Ambient particles and their measurement; Sources of atmospheric particles; Control measures; Relationships between emissions and air quality.

26107 (PB—81-120578) Source Test Data (SOTDAT) System information. (Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards). Nov 1980. 36p. NTIS, PC A03/MF A01.

The Source Test Data (SOTDAT) System is an automated data processing system used by the U.S. Environmental Protection Agency to store data from testing and analysis of emissions from stationary sources of air pollution. This booklet is designed for persons who are not familiar with SOTDAT, to provide a description of the system and examples of the computerized SOTDAT reports that are available upon request. To meet these objectives, this booklet includes: (1) and overview of the data contained in SOTDAT, (2) descriptions of related publications, (3) a description of procedures for requesting SOTDAT data and (4) a description of SOTDAT report capabilities and examples of available computerized report formats. A list of additional references is provided for background information.

26108 Climate change and cloud feedback: The possible radiative effects of latitudinal redistribution. Potter, G.L.; Ellsaesser, H.W.; MacCracken, M.C.; Mitchell, C.S. (Lawrence Livermore Laboratory, University of California, Livermore, CA 94550). W-7405-ENG-48. *Journal of the Atmospheric Sciences ;* **38**: No. 3, 489-493(Mar 1981).

The sensitivity of outgoing longwave flux to changes in cloud cover (partialF/partialA/sub c/) as defined by Cess (1976) must be evaluated carefully to avoid discrepancies arising from the interchange of averaging conventions. In a recent zonal atmospheric model experiment the global value of partialF/partialA/sub c/ was different in sign than in other calculations. This difference in behavior was traced to a latitudinal redistribution of cloud amount

and height that occured in the doubled CO_2 experiment. However, when partialF/partialA/sub c/ was evaluated at individual latitudes and then weighted globally, the value of this parameter was consistent with those found by Cess (1976) and Budyko (1974).

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 24935, 25604, 25974, 26181, 26182, 26183, 26184, 26185, 26186, 26187, 26188, 26189, 26190, 26191, 26200, 26204, 26248, 26249, 26252, 26253, 26254, 26255, 26256, 26257, 26258, 26259, 26260, 26261, 26262, 26263, 26264, 26265, 26266, 26267, 26268, 26269, 26270, 26271, 26272, 26273, 26274, 26275, 26278, 26280, 26281, 26282, 26333, 26334, 26335, 26337, 26338, 26339, 26340, 26342, 26343, 26345, 26346, 26348, 26349, 26350, 26351, 26352, 26353, 26354, 26355, 26356, 26357, 26358, 26359, 26360, 26362, 26365, 26378, 26393

26109 (AD-A—089962) Impact of aircraft emissions on air quality in the vicinity of airports. Volume I. Recent airport measurement programs, data analyses, and sub-model development. Final report Jan78-Jul 80. Yamartino, R.J.; Smith, D.G.; Bremer, S.A.; Heinold, D.; Lamich, D. (Argonne National Lab., IL (USA)). Jul 1980. Contract DOT-FA77WAI-736. 171p. NTIS, PC A08/MF A01.

This report documents the results of the Federal Aviation Administration (FAA)/Environmental Protection Agency (EPA) air quality study which has been conducted to assess the impact of aircraft emissions of carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NOx) in the vicinity of airports. This assessment includes the results of recent modeling and monitoring efforts at Washington National (DCA), Los Angeles International (LAX), Dulles International (IAD), and Lakeland, Florida airports and an updated modeling of aircraft generated pollution at LAX, John F. Kennedy (JFK) and Chicago O'Hare (ORD) airports. The Airport Vicinity Air Pollution (AVAP) model which was designed for use at civil airports was used in this assessment. In addition the results of the application of the military version of the AVAP model the Air Quality Assessment Model (AQAM), are summarized.

26110 (AD-A—090552) The decomposition of N_2O on Ni(110). Technical report. Sau, R.; Hudson, J.B. (Rensselaer Polytechnic Inst., Troy, NY (USA). Dept. of Materials Engineering). 15 Sep 1980. Contract N00014-75-C-0730. 23p. NTIS, PC A02/MF A01.

The catalytic decomposition of N2O to yield N2 gas and adsorbed oxygen has been studied on the Ni(110) surface over the temperature range from 323 to 873K. The combination of Auger electron spectroscopy and molecular beam mass spectrometry has been used to determine the overall rates of production of adsorbed oxygen and N2 gas, and the scattering behavior of unreacted N2O. These data have been analysed to determine the single collision reaction probability as a function of surface temperature and adsorbed oxygen coverage. The reaction precedes from a zero-coverage reaction probability of from 0.97 and 0.52 depending on temperature, to zero reaction probability at an adsorbed oxygen coverage of 1/3 ML. The behavior at partial oxygen coverage is strongly influenced by the presence of a molecular precursor species, especially at low temperatures. (Author)

26111 (ANL—81-12) Analytical techniques for ambient sulfate aerosols. Johnson, S.A.; Graczyk, D.G.; Kumar, R.; Cunningham, P.T. (Argonne National Lab., IL (USA)). Jun 1981. Contract W-31-109-ENG-38. 40p. NTIS, PC A03/MF A01. Order Number DE81024481.

Work done to further develop the infrared spectroscopic analytical method for the analysis of atmospheric aerosol particles, as well as some exploratory work on a new procedure for determining proton acidity in aerosol samples is described. Earlier work had led to the successful use of infrared (ir) spectrophotometry for the analysis of nitrate, ammonium, and neutral and acidic sulfates in aerosol samples collected by an impactor on a Mylar-film substrate. In this work, a filter-extraction method was developed to prepare filter-collected aerosol samples for ir analysis. A study was made comparing the ir analytical results on filter-collected samples with impactor-collected samples. Also, the infrared analytical technique was compared in field studies with light-scattering techniques for aerosol analysis. A highly sensitive instrument for aerosol analysis using attenuated total internal reflection (ATR) infrared spectroscopy was designed, built, and tested. This instrument provides a measurement sensitivity much greater (by a factor of 6 for SO_4^{2-}) than that obtainable using the KBr-pellet method. This instrument collect size- and time-resolved samples and is potentially capable of providing automated, near real-time aerosol analysis. Exploratory work on a novel approach to the determination of proton acidity in filter- or impactor-collected aerosol samples is also described. In this technique, the acidic sample is reacted with an access of a tagged, vapor-phase base. The unreacted base is flushed off and the amount of the tag retained by the sample is a direct measure of the proton acidity of the sample. The base was tagged with Ge, which can be conveniently determined by the x-ray fluorescence technique.

26112 (BNL—29526) Technologies for the recovery and disposal of carbon dioxide. Steinberg, M. (Brookhaven National Lab., Upton, NY (USA)). Apr 1981. Contract AC02-76CH00016. 31p. (CONF-810813—8). NTIS, PC A03/MF A01. Order Number DE81025077.

From National American Chemical Society summer meeting; New York, NY, USA (23 Aug 1981).

A study was made on the technical feasibility and economic costs of CO_2 control, should the need arise for regulating the quantity of CO_2 contained in the atmosphere. Means of CO_2 control and recovery are discussed. The four ways of disposing of captured CO_2 considered are: injection in the deep ocean; terrestrial burial; storage in plants and trees; and, conversion of CO_2 to useful products. Although the costs would be substantial, deep ocean disposal appears to be a possibility. (JGB)

26113 (BNL—29741) Capabilities for research on acid rain. Manowitz, B. (Brookhaven National Lab., Upton, NY (USA)). May 1981. Contract AC02-76CH00016. 48p. NTIS, PC A03/MF A01. Order Number DE81025117.

Acid rain studies at Brookhaven National Laboratory (BNL) are conducted within the Department of Energy and Environment, in the divisions of Atmospheric Sciences, Environmental Chemistry, Land and Freshwater Environmental Sciences, and Biomedical and Environmental Assessment of the National Center for the Analysis of Energy Systems. The capabilities and ongoing activities of each of these organizations which relate to the acid rain problem are summarized here.

26114 (BNL—51289) Regional issue identification and assessment program (RIIA) Issue paper 2. Atmospheric long-range transport lead laboratory methodology. Meyers, R.E.; Kleinman, L.I.; Li, T.Y.; Cederwall, R.T. (Brookhaven National Lab., Upton, NY (USA)). Mar 1981. Contract AC02-76CH00016. 45p. NTIS, PC A03/MF A01. Order Number DE81023979.

The Brookhaven National Laboratory long-range transport air quality model, Atmospheric Impact of Residual SO/sub x/ (AIRSOX) has been used to predict sulfur dioxide and sulfate concentrations due to utility and industrial emissions, for the 1978 Energy Information Administration(EIA) Mid-Mid scenario of energy supply and demand for the years 1985 and 1990. The results of the air quality calculations are presented for the ten federal regions according to fuel type and source type. The corresponding calculations have also been performed for a base case year, 1975, and the results compared with measurements. Partly because of the emission control levels assumed in the EIA scenario, SO_2 emissions in 1985 and 1990 are lower than in 1975 despite increases in fuel consumption and a shift from oil to coal in the utility and industrial sectors. National average sulfur oxide concentrations are calculated to be lower in 1985 and 1990 than in 1975.

26115 (CONF-800365—, pp 14-21) **Atmospheric transport of pollutants.** Dovland, H.; Semb, A. (Norwegian Inst. for Air Research, Lillestroem). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The pathway of pollutants through the atmosphere is determined by a series of physical and chemical processes: advection, turbulent diffusion, chemical transformation and various removal mechanisms. The relative importance of each of these processes de-

pends on chemical and physical characteristics of the pollutant, and also on the distance of transport. In this presentation the main emphasis is on transport over distances from a few hundred to several thousand kilometres, on the long-range transport of air pollutants.

26116 (CONF-800365—, pp 22-32) **Removal of sulphur and nitrogen compounds from the atmosphere in rain and by dry deposition.** Fowler, D. (Inst. of Terrestrial Ecology, Midlothian, Scotland). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The relative importance of wet and dry deposition varies systematically with distance from source areas of the gases SO_2, NO and NO_2 to rural and upland areas remote from industrial sources. Although many site factors including topographic and meteorological characteristics of the area and the distribution of major sources relative to the site in question lead to variation between sites at similar distances from source areas, the ratio dry deposited sulphur (or nitrogen)/wet deposited sulphur per unit area per unit time changes from 8 to 12 for areas with large concentrations of CO_2 and NO/sub x/ ($\geqq$ 20 ppbv) to $\leqq$ 1 for the areas $\geqq$ 300 km from major sources of these gases. It is noteworthy that even in these remote areas where SO_2 and NO/sub x/ concentrations are small (1 to 5 ppbv SO_2, NO/sub x/) dry deposition is still a large contributor to total deposition.

26117 (CONF-800365—, pp 75-83) **Properties of acidified waters.** Dickson, W. (National Swedish Environment Protection Board, Solna). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Acid precipitation water has its properties from acid emissions and from reactions within the atmosphere. Acid soil water has its properties from precipitation and from reactions within the soil. Acid run off water becomes a mixture of precipitation, irrigation, drainage and ground water. The different origins can be detected by analyzing the water. If the acidity comes from sulfur or nitrogen and if these do not derive from the soil, then the acid comes from the atmosphere. Due to reactions in the soil, run off water becomes less acidic than the precipitation water - but much more complicated.

26118 (CONF-800365—, pp 100-101) **Analysis of organic micropollutants in aerosols.** Alfheim, I. (Central Inst. for Industrial Research, Oslo, Norway); Stoebet, M.B.; Gjoes, N.; Bjoerseth, A.; Wilhelmsen, S. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This paper discusses a quantitative chemical analysis of respirable particles, which could be transported over great distances. During this transport of pollutants, chemical reactions may take place to transform these pollutants to chemical compounds whose biological effects are less known.

26119 (CONF-800365—, pp 102-103) **Contribution from long-range atmospheric transport to the heavy metal pollution of surface soil.** Allen, R.O.; Steinnes, E. (Institutt for Atomenergi, Kjeller, Norway). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Sampling of soils in a regional analysis of Norway shows a distinct correlation between the environmental transport and deposition of various metals from pollution sources outside of the country. The data obtained during this study show a pattern of deposition from precipitation which suggests variable behavior of the metals measured.

26120 (CONF-800365—, pp 106-107) **Acid precipitation in the Keweenaw Peninsula of Michigan's Upper Peninsula.** Dohrenwend, R.E.; Shetron, S.G.; Stottlemyer, J.R.; Olszewski, R.J. (Michigan Technological Univ., Houghton). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The data collected during this study represent the chemical quality of precipitation for the Keweenaw Peninsula region. This effort will be mapped by pH values to pinpoint the major sources of contamination.

26121 (CONF-800365—, pp 108-109) **Wind tunnel studies of dry deposition of SO_2 and H_2SO_4 aerosols.** Dollard, G.J. (Univ. of Nottingham, England); Vitols, V. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This laboratory investigation reports on the dry deposition of aerosols to coniferous plants. Experimentation is performed using a wind tunnel to simulate atmospheric conditions. These studies may be directly applied to estimating the deposition of particles in forested areas.

26122 (CONF-800365—, pp 112-113) **Susceptibility of aquatic and terrestrial resources of Minnesota, Wisconsin, and Michigan to impacts from acid precipitation: informational requirements.** Glass, G.E. (Environmental Research Lab., Duluth, MN). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The data collected from this regional analysis can be used in comparison studies of ecological responses to acid precipitation observed in Scandinavia. The importance of measuring pollutant components determines if chemical and biological forms and concentrations contributing to total doses are comparable when interpreting cause-effect relationships.

26123 (CONF-800365—, pp 114-115) **Sensitivity of the United States environment to acid precipitation.** Glass, N.R. (Environmental Protection Agency, Corvallis, OR); Powers, C.F.; Lee, J.J.; Rambo, D.L.; O'Guinn, D.W. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This survey shows an urgent need to monitor streams, watersheds, and fish populations, test perennial crops, orchard crops, and managed forest species over a several year span. An expanded, well funded, multidisciplinary research effort is imperative if human welfare is to be protected.

26124 (CONF-800365—, pp 116-117) **Atmospheric deposition of trace elements in Norway.** Hanssen, J.E. (Norwegian Inst. for Air Research, Lillestroem); Rambaek, J.P.; Semb, A.; Steinnes, E. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A measurement program for trace elements using moss samples as a quantitative measure of deposition was carried out in Norway. A comparison was made between an estimated deposition of trace elements by precipitation and the average concentration absorbed in moss samples.

26125 (CONF-800365—, pp 118-119) **Acid precipitation in Florida (USA): results of a statewide monitoring network.** Hendry, C.D.; Brezonik, P.L.; Edgerton, E.S. (Univ. of Florida, Gainesville). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Monitoring of acid precipitation throughout Florida was conducted to determine volume-weighted mean pH. The resulting data were used to make state-wide comparisons on seasonal variations of hydrogen ion concentrations.

26126 (CONF-800365—, pp 120-121) **Deposition of air pollutants in Norway.** Joranger, E.; Schaug, J.; Semb, A. (Norwegian Inst. for Air Research, Lillestroem). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Seasonal variations in the deposition of air pollutants has been proven in Norway. Data collected over the last eight years have led to the approximation of sulfur component concentrations in precipitation measured in various regions of the country.

26127 (CONF-800365—, pp 122-123) **Acid precipitation and ecological effects in Northern California.** McColl, J.G. (Univ. of California, Berkeley). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A statistical analysis of acid precipitation was conducted in northern California to determine chemical characteristics of the pollutants. Environmental effects on ecosystems were also studied.

26128 (CONF-800365—, pp 124-125) **Analysis of atmospheric precipitation in Czechoslovakia.** Moldan, B. (Ustredni Ustav Geologicky, Prague, Czechoslovakia). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Samples of atmospheric precipitation were analyzed to determine chemical composition, and then were compared with results observed in other areas of the country.

26129 (CONF-800365—, pp 126-127) **Comparative composition of continential and Nova Scotian precipitation.** Ogden, J.G. III. (Dalhousie Univ., Halifax, Nova Scotia). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Sampling of precipitation in Nova Scotia was done on weather systems moving from the continental interior toward the maritime province. The average ionic strengths of precipitation values were compared in a regional analysis.

26130 (CONF-800365—, pp 128-129) **Map of areas potentially sensitive to wet and dry acid deposition in the United States.** Root, J. (Teknekron Research, Inc., Berkeley, CA); McColl, J.; Niemann, B. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A nationwide monitoring network has established a map of sensitive areas that are the most susceptable to the deposition of acidic materials.

26131 (CONF-800365—, pp 130-131) **Relationship between relief and deposition of some organic and inorganic contaminants in snow of northern Bavaria, F.R.G.** Schrimpff, E. (Bayreuth Univ., Germany). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The data presented in this study suggest that topography should be a consideration when evaluating a regional analysis of air pollutants.

26132 (CONF-800365—, pp 132-133) **Alberta oil sands environmental research program. An overview.** Smith, S.B.; Sandhu, H.S. (Alberta Dept. of Environment, Edmonton). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Evidence to date indicates that significant effects of S emissions on ecosystem cannot be documented and apparently are below the physiological threshold for damage. No correlation has been made between sulfate concentrations in precipitation and pH of soils. At present, therefore, there appears to be no cause for alarm as to the impacts of air pollution on the environment, as a result of oil sands development. Notwithstanding the apparent lack of significant effects of air pollution from oil sands plants, the Government of Alberta is proceeding with the design and implementation of biomonitoring networks, both for terrestrial and aquatic ecosystems. This network will use both floral and faunal indicators and will be operated in close co-operation with atmospheric research programs, to provide early warning capabilities for assessing pollution impacts.

26133 (CONF-800365—, pp 134-137) **Role of clouds in atmospheric transport of mercury and other pollutants: 1. The link between acid precipitation, poorly buffered waters, mercury and fish. 2. The role of cloud water in atmospheric transport.** Tomlinson, G.H. (Domtar Inc., Senneville, Quebec); Brouzes, R.J.P.; McLean, R.A.N.; Kadlecek, J. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data provided in these studies indicate that factors leading to increased mercury content in lakes may be reversed by neutralizing an aquatic environment. Losses in mercury from industrial and natural sources are decreasing as a result of better controls and development, but studies of cloud composition could possibly provide information leading to a link between mercury sources and affected waters.

26134 (CONF-800365—, pp 138-139) **Detection of acid compounds in the atmosphere by careful sampling and analysis of rainwater.** Slanina, J. (Netherlands Energy Research Foundation (ECN), Petten); Asman, W. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Research programs are now investigating the methods by which sampling of atmospheric contaminants should be carried out. It was concluded that concentration ratios of contaminants was dependent on the origin of the air mass sampled.

26135 (CONF-800365—, pp 140-141) **Meteorological interpretation of the chemical composition of precipitation and some results of sequential rain sampling.** Asman, W.A.H. (State University, Utrecht, Netherlands); Slanina, J. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A regional analysis in the Netherlands on the chemical composition of precipitation was conducted for samples of continental air masses. All data were used as an average for concentrations of chemical deposition.

26136 (CONF-800365—, pp 142-143) **pH and sulphate content of precipitation over Northern Britain.** Nicholson, I.A. (Inst. of Terrestrial Ecology, Kincardineshire, England); Cape, N.; Fowler, D.; Kinnaird, J.W.; Paterson, I.S. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data for pH values of precipitation and excess concentrations of sulfur were recently recorded in the United Kingdom. Sampling of air pollutants established a relationship between sulfate and hydrogen ion concentrations at several stations.

26137 (CONF-800365—, pp 144-145) **Continuous monitoring of airborne pollutants.** Nicholson, I.A.; Fowler, D.; Paterson, I.S.; Cape, J.N.; Kinnaird, J.W. (Inst. of Terrestrial Ecology, Midlothian, Scotland). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A statistical analysis of the monitoring of air pollution has shown variations in pollutant concentrations at different times of day and night. Higher levels of fossil fuel combustion during winter months have caused increases in sulfur dioxide and nitrogen oxide concentrations. Photochemical ozone levels in summer also may explain other variations in gas concentrations.

26138 (CONF-800365—, pp 148-149) **Effects of a Scots pine (Pinus sylvestris L.) canopy on the chemical composition and deposition pattern of precipitation.** Nicholson, I.A.; Cape, N.; Fowler, D.; Kinnaird, J.W.; Paterson, I.S. (Inst. of Terrestrial Ecology, Kincardineshire, England). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This study attempts to provide information on the role of a forest canopy, using Scots pine, in relation to chemical composition

of precipitation and the pattern it takes as it is deposited to the forest floor.

26139 (CONF-800365—, pp 152-153) **Effects of simulated rain on the effluent from lysimeters with acid, shallow soil, rich in organic matter.** Abrahamsen, G.; Stuanes, A.O. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The effects of simulated acid and normal rainfall on the chemical effluents from lysimeters were measured over a two year span in Norway. The pH of affected soils was measured, and a chemical analysis was carried out.

26140 (CONF-800365—, pp 156-157) **Sulfate dynamics in natural environments. Preliminary results from a case study.** Braekke, F.H. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A case study in Norway has provided information on the effects of acid precipitation on free-standing water in peat. Lysimeters will determine water quality as it moves through natural environments.

26141 (CONF-800365—, pp 180-181) **Soil acidification by SO_2 emissions in Alberta, Canada.** Nyborg, M. (Univ. of Alberta, Edmonton); Parker, R.W.; Hodgins, L.W.; Laverty, D.H.; Takyi, S. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This paper concerns the deposition of SO_2 emissions, and especially the direct absorption of SO_2 by soils, and the possibility of resultant soil acidity. In Alberta, total anthropogenic SO_2 - S emissions are about 300,000 tons yearly, while natural emissions are estimated at 34,000 tons yearly. While average levels of SO_2 in the air in the Province are often below the detectable limits with present monitoring instruments, it was estimated that 0.0005 to 0.001 ppM of SO_2 might be typical for remote areas, and 0.003 to 0.006 ppM or slightly less for the vicinities of large emitters.

26142 **(CONF-810621—5) Analytical model of the round buoyant jet.** Lee, D.W. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 29p. NTIS, PC A03/MF A01. Order Number DE81023940.

From Symposium on fluid mechanics of combustion systems; Boulder, CO, USA (22 Jun 1981).

An analytical model for a round turbulent buoyant jet which is discharged vertically into a stagnant ambient is presented. The buoyant jet is considered to have three separate zone models which are matched to form a complete solution. The velocity field is determined for the entire jet and plume regions by the use of an eddy viscosity which varies along the axis of the jet. The centerline decay of buoyancy is determined throughout and the results are compared to existing numerical codes. The model is applied to the disposal of carbon dioxide enriched seawater. The results can be used to provide design information for minimizing or maximizing the dilution of a discharge by the receiving environment.

26143 **(DOE/ET/03425—21) Balance of the tropospheric ozone and its relation to stratospheric intrusions indicated by cosmogenic radionuclides. Technical progress report, November 1, 1980-June 30, 1981.** Reiter, R.; Kanter, H.J.; Sladkovic, R.; Jaeger, H.; Munzert, K.H. (Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Garmisch-Partenkirchen (Germany, F.R.). Inst. fuer Atmosphaerische Umweltforschung). Jun 1981. Contract AC02-76EV03425. 37p. NTIS, PC A03/MF A01. Order Number DE81025548.

The balance of the tropospheric ozone is studied with regard to sources and sinks. The influx of stratospheric ozone through stratospheric intrusions and photochemical production under pure air conditions is discussed. The 4-year measuring series (1977-1980) of the ozone concentration measured at 3 different levels are evaluated, the influence of meteorological parameters is examined. The time variation of the ozone layer between 1000 and 3000 m ASL is investigated as a function of different ozone sources. First results show that stratospheric ozone arriving at the troposphere penetrates only in a few rare cases to the ground layer below 1500 m ASL. Most of the time, the variation of ozone concentration in this layer is determined by photochemical processes which are, in turn, controlled by meteorological parameters. The upper boundary of the photochemically active layer is found at about 500 m above ground. Variability of the concentration of stratospheric aerosol and its optical properties after the volcanic eruptions in the year 1980 are discussed on the basis on lidar backscattering measurements.

26144 **(DOE/EV/10428—8) Modeling and analysis of air-quality data. Technical report No. 43.** Grivet, C.D. (Stanford Univ., CA (USA). Dept. of Statistics). Sep 1980. Contract AC02-80EV10428. 175p. NTIS, PC A08/MF A01.

Air pollution is monitored in the San Francisco Bay Area at some 30 stations. The data thus collected is meant to be representative of air pollution in the whole air basin. It is also assumed that the manner in which these data are summarized and reported is appropriate for comparisons with air quality standards. These two issues, the representativity of the air pollution data and the validity of certain statistical procedures used to process these data, are the subject matter of the present work. Oxidant concentrations during the months of July and August were used as the data base. The statistical interplay between pollution and weather is examined. The problem of spatial interpolation of pollution levels is approached using linear regression, partial correlations and kriging. Mathematical models are developed to test the validity of the assumption that there is not much difference between the use of overlapping versus nonoverlapping hourly averages of oxidant concentrations. (ACR)

26145 **(DOE/EV/10428—11) Brownian-motion model of pollutant-concentration distributions. Study on statistics and environmental factors in health (SIMS).** Ott, W.R. (SIAM Inst. for Mathematics and Society, Philadelphia, PA (USA); Stanford Univ., CA (USA). Dept. of Statistics). Apr 1981. Contract AC02-80EV10428. 59p. NTIS, PC A04/MF A01. Order Number DE81024430.

A study was conducted to provide insights into the reasons why unimodal, right-skewed frequency distributions are so often observed in measurements of pollutants in environmental media (air, water, and soil) by exploring the distributions generated by a simple Brownian motion process. In this process, concentration is observed at a fixed location analogous to a pollutant monitoring location, and the pollutant, consisting of a finite number of particles, is released from a single point source. The trajectories of the particles are subject to the usual Brownian motion assumptions, consistent with the laws of diffusion. By examining the probability distributions of concentrations generated by several different cases, it is seen that right-skewed unimodal distributions seem to be the rule rather than the exception.

26146 **(DOE/EV/10449—T1) Toxic organic compounds from energy production.** (Indiana Univ., Bloomington (USA). School of Public and Environmental Affairs). 1981. Contract AC02-80EV10449. 112p. NTIS, PC A06/MF A01.

The general objectives of this project are to identify potentially toxic organic compounds associated with energy production, to follow the fate of these compounds in the environment, and to improve the analytical methodology for making these measurements. All chemical work was carried out with the close collaboration of the genetic toxicology group at the Massachusetts Institute of Technology so that the biological effects of the chemical results could be quickly assessed. The work can be divided into four main areas: (a) the identification and quantitation of the mutagenic compounds associated with diesel engine soot as a function of engine type and operating condition; (b) the long-term fate of combustion generated chlorinated dioxins in both the atmosphere and lithosphere (marine and lacusterine sediments); (c) the analytical chemistry of hydraromatic compounds such as those found in coal liquids; and (d) the use of charge exchange, chemical ionization, mass spectrometry to produce different spectra of isomeric polycyclic aromatic hydrocarbons.

26147 (DOE/EV/10475—1) Preliminary evaluation of DOE-NEPA monitoring system. (ESCOR, Inc., Northfield, IL (USA)). 12 Feb 1981. Contract AC02-80EV10475. 119p. NTIS, PC A06/MF A01. Order Number DE81025061.

The objective of this analysis was to perform a preliminary investigation of the problems involved in designing a Department of Energy-National Environmental Policy Act (DOE-NEPA) compliance monitoring system. The requirement for such a system arose from the Council on Environmental Quality (CEQ-NEPA regulation effective July 30, 1979. The CEQ regulation uses the term monitoring to denote any method by which the lead agency can assure implementation of Environmental Impact Statement (EIS) and Record of Decision (ROD) environmental mitigation commitments. Monitoring is required for mitigation measures in important cases and may be carried out at agency discretion for all other cases. No definition of important is given in the regulation. The NEPA intent is that all environmental information and planning be incorporated into the decision process as early as possible. In keeping with this concept, any monitoring or enforcement program for a mitigation measure is expected to be adopted and briefly and concisely described in the ROD. Information is presented in four chapters entitled: federal and state compliance monitoring surveys; EIS information analysis; enforcement mechanisms; and administrative practice.

26148 (LBL—10881) Soot in urban atmospheres. Novakov, T. (Lawrence Berkeley Lab., CA (USA)). May 1980. Contract W-7405-ENG-48. 38p. (CONF-8005173—1). NTIS, PC A03/MF A01. Order Number DE81023241.

From National research council diesel impacts study committee meeting; Los Angeles, CA, USA (5 May 1980).

Soot is defined as the total primary carbonaceous material, i.e., the sum of graphitic carbon and primary organics. Data are presented on the concentrations of particulate carbon in a number of locations in the United States, and an estimate is given on the contribution of soot to the carbonaceous aerosol in urban atmospheres. (JGB)

26149 (ORNL/TM—7728) Preliminary environmenal assessment of the University of Minnesota, Duluth Coal Gasifier, FY 1980. Suter, G.W. II; Cushman, R.M. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 45p. NTIS, PC A03/MF A01. Order Number DE81025852.

Preliminary results are reported for the environmental assessment portion of a comprehensive monitoring and testing program focused on a small Foster-Wheeler/Stoic coal gasifier at the University of Minnesota, Duluth. Leachates of solid wastes (bottom ash and cyclone ash) from the gasifier were tested chemically and toxicologically. Trace element levels in the leachates were well below levels that would classify a solid waste as hazardous in accordance with the Resource Conservation and Recovery Act of 1976. Most other water quality criteria were satisfied as well. The leachates caused little or no toxic effect in a battery of toxicity tests using Daphnia magna, freshwater algae, and radish and sorghum seedlings. Ambient air quality was measured at two monitoring stations within 1 km of the gasifier. Levels of SO_2, NO/sub x/, O_3, hydrocarbons, and total suspended particulates were monitored at the two stations, and meteorological variables were monitored at the downwind (based on prevailing wind patterns) station. Ambient air quality was well within standards, except for hydrocarbons (the cause for this excess is under investigation). Conversion of the campus steam plant to partial use of gasifier products appears to have resulted in an increase in SO_2 and particulate emissions and a decrease in NO/sub x/ emissions relative to the previous fuel mix. No increments in ambient air pollution levels are attributable to the gasifier.

26150 (PB—81-111148) Technical assisTAnce report ta 80-33, Omaha waste pretreatment plant, omaha, Nebraska. Hervin, R.L. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Jun 1980. 11p. NTIS, PC A02/MF A01.

An environmental and medical survey was conducted on February 6 and April 3, 1980 at the Omaha Waste Pretreatment facility (SIC-9511) in Omaha, Nebraska. The management of the Public Works Department, City of Omaha, requested technical assistance from NIOSH to determine if any health hazards were present at the facility which employs 19 workers. Long term detector tubes were used for evaluation of personal and area exposure to hydrogen sulfide (7783064) (H2S). Personal and breathing zone samples were collected on charcoal tubes and analyzed by mass spectrometry to identify the presence of organic air contaminants. Short term detector tubes were used to detect other potential contaminants such as oxides of nitrogen and sulfur dioxide (7446095). Personal samples for H2S ranged from 0.5 to between 39.4 and 73.2 parts per million (ppm), with estimated 8 hour time weighted average (TWA) ranging from 4.2 to between 8.9 and 15.0 ppm. The current OSHA standard is 20 ppm for an 8 hour TWA with a 10 minute ceiling value of 50 ppm. Trace amounts of other contaminants were all less than 5 percent of the environmental criteria for these compounds. Interviewed employees reported past and current health problems such as irritations to the eyes and respiratory system. The authors conclude that a health hazard due to H2S existed at the pretreatment facility and probably existed as a prolonged intermittent exposure over the past several years. Recommendations are provided in ventilation, housekeeping, personal hygiene, and medical surveillance.

26151 (PB—81-111247) Health hazard evaluation determination report no. HE 79-31-699, University Corporation for Atmospheric Research, Mauna Loa Observatory, Hilo, Hawaii 96720. Belanger, P.L. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)). Jun 1980. 11p. NTIS, PC A02/MF A01.

An environmental survey was conducted from September 24 to 26, 1979 at the Mauna Loa Observatory, Hawaii (SIC-8922). An authorized employer representative requested the evaluation to determine whether solar observers and engineers working at the observatory were exposed to toxic chemicals emanating from the Mauna Loa volcano five miles away. Personal breathing zone and area air samples were collected to measure concentrations of methyl chloride (74873), methyl iodide (74884), inorganic mercury (7439976), sulfur dioxide (7446095), hydrogen sulfide (7783064), and selenium (7782492) and other metals in the telescope control room and telescope room. Airborne concentrations of methyl iodide, mercury, sulfuric acid, trace metals and hydrogen sulfide were below the limits of detection. Airborne concentrations of methyl chloride ranged from 0.02 to 0.08 parts per million (ppm) and were well below the OSHA standard of 100ppm as an 8 hour time weighted average (TWA). Sulfur dioxide concentrations ranging from 0.30 to 0.05ppm were all below or equal to NIOSH recommended criterion of 0.50ppm. The authors conclude that no hazard existed from exposure to any of the compounds.

26152 (PB—81-111460) Inventory of emissions from boating sources in California. Final report. Parker, N.R.; Dale, D.A.; Taback, H.J. (KVB, Inc., Irvine, CA (USA)). Jul 1980. Contract ARB-A8-138-31. 107p. NTIS, PC A06/MF A01.

This final report presents the distribution of boating fuel consumption and associated emissions in California, by waterway, county, and air basin. Two classes of small boats are considered. Pleasure boats are those craft owned by individuals and companies; used for cruising, water skiing, sport fishing and other recreational activities; and are powered by both gasoline and diesel engines. Commercial boats are those used for public transportation, commercial fishing, and other work functions such as tugboats, U.S. Coast Guard cutters, personnel and cargo hauling boats, etc. Commercial boats are powered primarily by diesel engines but there are a few gasoline powered craft. For the base year 1977, the statewide consumption of gasoline was 96,000,000 gallons and the consumption of diesel fuel was 36,000,000 gallons. The pollutant emission totals for 1977 were: SOx, 770 tons; CO, 105,000 tons; HC 26,000 tons; NOx, 3,600 tons and particulate matter 530 tons. Seasonal average daily emissions for winter and summer are shown in the report. The emission factors used in this study were obtained from EPA publication AP-42.

26153 **(PB—81-111536) Exposure to pollutants from domestic combustion sources: a preliminary assessment. Final report Aug 79-Feb 80.** Brookman, E.T.; Birenzvige, A. (TRC Environmental Consultants, Wethersfield, CT (USA)). Apr 1980. Contract EPA-68-02-3115. 51p. NTIS, PC A04/MF A01.

The report gives results of a preliminary assessment of exposure to pollutants from domestic combustion sources, some of which emit airborne particulate matter (PM), CO, and polycyclic organic matter (POM) near human receptors. Transient ambient concentrations of these pollutants at the receptor (and the corresponding time-averaged exposures) have been determined for the following domestic combustion sources: lawn mowing, chain sawing, charcoal cooking, indoor gas cooking, and indoor side-stream smoke. An experimental test program utilizing personal monitoring equipment was conducted to acquire data for the lawn mower, chain saw, and charcoal grill sources. Literature data were used to assess the indoor sources of gas cooking and side-stream smoke. Transient ambient concentrations of total suspended particulate (TSP) matter encountered were as high as 35 times the 24 hour secondary ambient air quality standard of 150 micrograms/cu m for TSP. However, large quanties of noncombustion-related PM on the filters (e.g., grass particles, sawdust), concurrent lower values of ambient CO relative to ambient air quality CO standards, and the absence of detectable POM indicate that these sources probably do not result in exposures to combustion-generated pollutants that are relatively significant.

26154 **(PB—81-112898) Application of photochemical models. Volume III. Recent sensitivity tests and other applications of the LIRAQ model. Final report.** Wada, R.Y.; Wong, M.J.; Leone, E.Y.; Robinson, L.H.; DeMandel, R.E. (Association of Bay Area Governments, Berkeley, CA (USA)). Dec 1979. Contract EPA-68-02-3046. 104p. NTIS, PC A06/MF A01.

A series of photochemical modeling experiments, using the LIRAQ model applied to the San Francisco Bay Area, was performed to investigate: (1) model sensitivity to the spatial resolution of the gridded emissions, (2) the impact of future HC and NO controls on the future Bay Area NO2 levels, and (3) the future impact of Bay Area HC and NO reductions on O3 in adjacent downwind valleys. The emission resolution experiments consisted of three simulations wherein emissions were smoothed over (1) 5 x 5 km areas, (2) 10 x 10 km areas, and (3) distributed according to population. Changing from 5 km to 10 km resolution changed the O3 maximum concentration by up to 10%. When emissions were distributed proportional to population substantial changes occurred in the timing and magnitude of the O3 maxima. The short-term NO2 experiments consisted of simulating O3 and NO2 fields under meteorological conditions favoring high NO2 buildups. Sensitivity runs were made which suggest that HC control is the most effective strategy for both O3 and NO2. The long range transport experiments consisted of modifying LIRAQ to simulate an expanded 160 x 160 km region that included portions of the Sacramento and San Joaquin Valleys as a 'receptor' region. The results showed that for the prototype day used, downwind O3 was more strongly influenced by initial and boundary conditions than by Bay Area emissions changes.

26155 **(PB—81-113623) Application of computer graphics to air quality data analysis. Technical report.** Vanderpol, A.H. (Meteorology Research, Inc., Altadena, CA (USA)). Feb 1980. 82p. NTIS, PC A05/MF A01.

The utility of analyzing large scientific data analysis programs on a small computer (HP21MX) was demonstrated by analyses of the European Air Chemistry Network (EACN) acid rain chemistry data with the International Meteorological Institute in Stockholm, Sweden. The analysis focused on understanding and quantifying analytical errors in the data and providing statistics for development of a simple photochemical model. Errors in the data base resulted from the processes of collecting the rain water, analyzing it for ions, and recording the values. A statistical approach was employed to identify and correct errors in the data base. The median values supplied were over several years and stations. The model examined concurrent sulfate and nitrate formation processes during transport from the source of the primary sulfur and nitrogen oxides. The most important tentative conclusion of the model study is that atmospheric sulfate and nitrate formation rates are interdependent and nonlinear, suggesting that the reduction of emissions of either oxides of sulfur and/or nitrogen will not necessarily result in a proportional reduction of the acidity of rain downwind from the sources. Detailed appendices discuss EACN errors, formation of sulfuric and nitric acids, and five computer programs.

26156 **(PB—81-113920) Automobile and light-duty truck surface coating operations-background information for promulgated standards. Final report.** (Environmental Protection Agency, Research Triangle Park, NC (USA). Emission Standards and Engineering Div.). Sep 1980. 35p. NTIS, PC A03/MF A01.

This document contains a summary of public comments, EPA responses, and a discussion of differences between the proposed and promulgated standards of performance to control volatile organic compounds (VOC) emissions from new, modified, and reconstructed automobile and light-duty truck surface coating operations in the U.S. The standards are being promulgated under Section III of the Clean Air Act.

26157 **(PB—81-114381) The ELSTAR stationary source emissions data preprocessor. Software.** Lurmann, F.; Godden, D. (Environmental Research and Technology, Inc., Westlake Village, CA (USA)). 31 Mar 1980. 1p. Source tape is in EBCDIC character set. Tapes can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions. Price includes documentation, PB80-184575.

This tape contains computer programs designed to preprocess stationary point source emissions data for the ELSTAR photochemical air quality simulation model. The ELSTAR model requires hydrocarbon, oxides of nitrogen, carbon monoxide and oxides of sulfur emissions data for stationary point sources. The program converts emissions data compiled in the U.S. EPA's Emissions Inventory Subsystem (EIS) format to the format required by the ELSTAR model. The conversion process includes assignment of source data to source categories, assignment of diurnal operating characteristics, assignment of hydrocarbon emission composition profiles (in six classes) and conversion of source locations to emissions grid square indices. Major point sources are inventoried separately from minor point sources in processing...Software Description: The program is written in the Fortran programming language for implementation on a CDC 6400 computer using the Goleta 1.0 operating system. 40K bytes of core storage are required to operate the model.

26158 **(PB—81-114670) Informational report: 1979 progress of the chemical characterization panel of the composition of diesel exhaust project and results of particulate extraction round-robin.** (Coordinating Research Council, Inc., Atlanta, GA (USA)). Mar 1980. 75p. NTIS, PC A04/MF A01.

Issuance of EPA Advisory Circular No. 76 (AC-76) on Unregulated Diesel Emissions in June 1978 clearly required the development of improved chemical characterization methods. The Coordinating Research Council Chemical Characterization Panel of the Composition of Diesel Exhaust Project No. CAPI-1-64 was formed to carry out this work. The in-house working panel was formed in an attempt to accelerate the validation of chemical analysis methods to measure unregulated emissions. This report covers the status of several objectives of the Chemical Characterization Panel and reviews in detail the results of the panel's first round-robin dealing with the extraction of particle bound material. The initial meeting of the panel was held on January 18, 1979. The report covers the progress made the first year.

26159 **(PB—81-114738) Analytical and experimental assessment of highway impact on air quality: data analysis and model evaluation. Research report (final) Sep 74-21 Jan 80.** Bullin, J.A.; Polasek, J.C.; Green, N.J. (Texas Transportation Inst., College Station (USA)). 21 Jan 1980. 209p. NTIS, PC A10/MF A01.

Air pollution data were collected at six sites in Texas. The data have been screened, reduced, and put into 5-minute and 15-

minute data records to form a large data base. These data are arranged for easy use for model development or evaluation. In this report, the development of a new pollutant dispersion model, TRAPS IIM is described. This model, along with several instruments are analyzed. Power spectra, cross correlation, and probability densities of two data cases are discussed and interpreted.

26160 (PB—81-118994) Waste disposal inventory for Mississippi-Alabama coastal counties. Nissan, E.; Williams, D.C. Jr; Brister, B.M.; Nelson, R.G.; Hardy, W.E. Jr. (Mississippi-Alabama Sea Grant Consortium, Ocean Springs, MS (USA)). Jun 1980. 35p. NTIS, PC A03/MF A01.

The purpose of this report is to determine the physical magnitudes of air, water, and solid waste pollution generated through the economic activities of the coastal region of Mississippi and Alabama. It is a joint effort undertaken by two separate study groups in Mississippi and Alabama. Although there was coordination in developing the models, it was necessary for each unit to construct its own model for its own coastal region. The combined information common to both regions was extracted and adapted to produce this report. The coastal counties included are: Hancock, Harrison, and Jackson in Mississippi and Mobile and Baldwin in Alabama. As a unit, these counties comprise an important economic section with an anticipated vital growth in population and commerce.

26161 (UCRL—51444-80) Program report for FY 1980. Atmospheric and Geophysical Sciences Division of the Physics Department. Knox, J.B.; Orphan, R.C. (eds.). (Lawrence Livermore National Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 89p. NTIS, PC A05/MF A01. Order Number DE81025120.

The FY 1980 research program conducted by the Atmospheric and Geophysical Sciences Division and supporting segments at Lawrence Livermore National Laboratory is reviewed briefly. The work is divided into five research themes: advanced modeling, regional modeling and assessments, CO_2 and climate research, stratospheric research, and special projects. Specific projects are described, and significant findings of the work are indicated. Unique numerical modeling capabilities in use and under development are described.

26162 (UCRL—84878) Electrostatic air filters generated by electric fields. Bergman, W.; Biermann, A.H.; Hebard, H.D.; Lum, B.Y.; Kuhl, W.D. (Lawrence Livermore National Lab., CA (USA)). 27 Jan 1981. Contract W-7405-ENG-48. 38p. (CONF-800953—2). NTIS, PC A03/MF A01. Order Number DE81023658.

From Annual meeting of the Fine Particle Society; Washington, DC, USA (16 Sep 1980).

This paper presents theoretical and experimental findings on fibrous filters converted to electrostatic operation by a nonionizing electric field. Compared to a conventional fibrous filter, the electrostatic filter has a higher efficiency and a longer, useful life. The increased efficiency is attributed to a time independent attraction between polarized fibers and charged, polarized particles and a time dependent attraction between charged fibers and charged, polarized particles. The charge on the fibers results from a dynamic process of charge accumulation due to the particle deposits and a charge dissipation due to the fiber conductivity.

26163 (UCRL—85754) Causes of CO_2-induced sensitivity in a zonal climate model. MacCracken, M.C. (Lawrence Livermore National Lab., CA (USA)). Jun 1981. Contract W-7405-ENG-48. 15p. (CONF-810687—1). NTIS, PC A02/MF A01. Order Number DE81023666.

From US/USSR workshop on carbon dioxide and climate; Leningrad, USSR (15 Jun 1981).

The responses of climate models to increased concentrations of carbon dioxide depend on the interactions of a number of different processes. The separate and interacting roles of various feedback mechanisms can be identified by comparing the solar and terrestrial radiative fluxes calculated for the control simulation with those calculated when individual variables from a CO_2-perturbed simulation are sequentially substituted for control values. In a simulation using the LLNL two-dimensional climate model, increased CO_2 and water vapor and decreased surface albedo lead to a strong warming of the surface-troposphere system. Changes in cloud amount and distribution, however, lead to slight cooling, thereby helping to buffer the climate change induced by a doubling of CO_2. The separately calculated effects can very nearly be linearly combined to arrive at the total climatic response.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 25975, 25976, 26161, 26197, 26198

26164 (CONF-800438—, pp 215-236) Ionizing radiation levels in energy conserving structures. May, H. (Argonne National Lab., IL). 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

The physical principles governing the release of radon gas as a result of the decay of the parent element radium, found everywhere in the soil and many building materials, are discussed. Factors contributing to concentration or build-up within a building are examined. Knowing how radon enters facilitates the design of structures so that the possibility of significant concentration levels may be minimized. What health effects may be predicted at the levels which have been observed or appear to be possible are examined. Data are presented on radon and daughter concentrations in some selected houses.

26165 (DP—1556) Dispersion of radioactive pollutant in a tornadic storm. Pepper, D.W. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). May 1981. Contract AC09-76SR00001. 102p. NTIS, PC A06/MF A01. Order Number DE81026336.

A three-dimensional numerical model is used to calculate ground-level air concentration and deposition (due to precipitation scavenging) after a hypothetical tornado strike at a plutonium fabrication facility in Pennsylvania. Plutonium particles less than 10 μm in diameter are assumed to be lifted into the tornadic storm cell by the vortex. The rotational characteristics of the tornadic storm are embedded within the larger mesoscale flow of the storm system. The design-basis translational wind values are based on probabilities associated with existing records of tornado strikes in the vicinity of the plant site. Turbulence exchange coefficients are based on empirical values deduced from experimental data in severe storms and from theoretical assumptions obtained from the literature. The quasi-Lagrangian method of moments is used to model the transport of concentration within a grid cell volume. In all case studies, the effects of updrafts and downdrafts, coupled with scavenging of the particulates by precipitation, account for most of the material being deposited within 20 to 45 km downwind of the plant site. Ground-level isopleths in the x-y plane show that most of the material is deposited behind and slightly to the left of the centerline trajectory of the storm. Approximately 5% of the material is dispersed into the stratosphere and anvil section of the storm.

26166 (HEDL-SA—2302) Continuous-release formulation for environmental doses to moving receptors. Piepho, M.G. (Hanford Engineering Development Lab., Richland, WA (USA)). 1981. Contract AC14-76FF02170. 6p. (CONF-810606—58). NTIS, PC A02/MF A01. Order Number DE81024096.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Atmospheric dispersion models frequently assume a puff release or several puff releases, each of which are described separately. A dispersion model should better describe a continuous release as more puffs are assumed, but the computational cost and bookkeeping difficulty increases with additional puffs. A new formulism is derived in this work which replaces the puff approximation. With the new continuous release formulation, radioactive dose calculations to moving receptors are more accurately calculated without any great additional computation. There are several advantages of a continuous release formulation. With this formulation, a dose rate to a moving receptor is calculated as a function of time. The dose-rate will increase (decrease) as the bulk of the release gets closer (farther) to (from) the receptor which is at position x(t), y(t). The receptor may follow any x, y trajectory as a function of time, and the dose rate will be calculated along the path.

26167 (IS—4768) Environmental monitoring at Ames Laboratory: calendar year 1980. Voss, M.D. (Ames Lab., IA (USA)). Apr 1981. Contract W-7405-ENG-82. 54p. NTIS, PC A04/MF A01. Order Number DE81025525.

The results and conclusions from the Ames Laboratory environmental monitoring programs for the Ames Laboratory Research Reactor (ALRR) and other Laboratory facilities are presented. The major areas of radiological monitoring were ALRR effluent air, environmental air, effluent water and environmental water. A summary of the radioactivity found in the environment is presented. The ALRR ceased operation on December 1, 1977. Decommissioning activities began January 3, 1978, and are scheduled for completion October 1, 1981. Analysis of air samples collected at the ALRR on-site station showed no radioactivity that could be attributed to ALRR operations. The radiosotope of significance in the ALRR stack effluent was tritium (H-3). The yearly individual dose from H-3 at the exclusion fence was estimated to be 0.016 mRem and the estimated dose to the entire population within an 80 Km (50 mile) radius of the ALRR was 26.6 man-Rem. These values are 0.0032% and 0.026%, respectively, of the doses derived from the concentration guides. On September 1, 1978, the ALRR site was connected to the City of Ames sanitary sewage system. All liquids (except building foundation and roof water) from the ALRR complex are now discharged to the sewage system negating the requirement for monitoring chemical constituents of effluent and environmental waters. In the radioactive liquid waste released to the City of Ames sewage system from the ALRR complex, H-3 was the predominant isotope. After dilution with other waste water from the ALRR complex, the potential dose was not more than 0.68% of the dose derived from the concentration guide. Building foundation and roof water are discharged to a drainage gulch on site.

26168 DOE-OES-EML quality assurance program. Sanderson, C.G. (Dept. of Energy, New York, NY). *American Society for Testing and Materials, Special Technical Publication ;* No. 698, 289-293(1980). (CONF-780719—).

From Conference of the American Society for Testing and Materials; Johnson, VT, USA (9 Jul 1978).

Contractor laboratories handling radioactive materials for the US Department of Energy (DOE) are required to monitor the environmental exposure and publish annual reports for the Division of Operational and Environmental Safety (OES). In order to determine the validity of the data contained in these reports the Environmental Measurements Laboratory (EML) was requested to develop, coordinate, and conduct an Environmental Quality Assurance Program (QAP). There are four major phases to the DOE-OES-EML Quality Assurance Program: sample collection and preparation, sample analyses at EML, quarterly sample distribution, and reporting the data returned by the participants. The various phases of the QAP and the data reported during the first year of the program are discussed.

26169 Spiked sample standards; their uses and disadvantages in analytical quality control. Bowen, V.T. (Woods Hole Oceanographic Inst., MA); Volchok, H.L. Contract EY-76-C-02-3563. *Environment International ;* **3**: No. 5, 365-376(1980).

Standard samples, that is matrices containing precisely known concentrations of various radionuclides, are necessary adjuncts to any analytical quality control program. In general, we prefer the use of natural matrix standards, samples into which the radionuclides have become incorporated under natural conditions, and over as long a time span as possible. Under some circumstances, however, real advantages are offered by spiked sample standards samples to which the isotope of interest has been added in a precisely known amount, at the time of preparing the standard. It is our purpose to discuss the advantages and disadvantages of spiked standards and to contrast them with those of natural matrix standards, as well as to discuss the preparation of the former class of standards and the evidence supporting our recommendation of caution in their use. In general, spiked standards offer advantages of low cost of preparation, of advance assurance that the amount and chemical form of the radioisotopes added are known, and of the possibility of preparation of unnatural matrices, or of nuclides that are to be expected but not yet to be found in nature. The most salient disadvantages of spiked standards derive from the usual uncertainty concerning the concentration of any radionuclides in the matrix before spiking and from the difficulty of insuring that there will be no difference in analytical behaviorbetween the spike and the same isotope that has become incorporated in the matrix under natural conditions. Consideration of these advantages and disadvantages leads to identification of a list of special problems for which spiked standards may be advantageous and of a list of precautions indicated in the interpretation of the resulting data. The arguments against the general applicability of spiked standards appear overwhelming.

5004 Thermal Effluents Monitoring And Transport

26170 Power plant induced rainfall modification: Fact or fiction?. Patrinos, A.A. (Technical University of Athens). W-7405-ENG-26. *Physics Teacher ;* **19**: No. 3, 173-180(Mar 1981).

The METER Program of the Department of Energy is discussed. It is concluded that there is at present no evidence of power plant effects on rainfall.(AIP)

5005 Site Resource And Use Studies

26171 (PB—81-116097) Profile of air quality in Region V. Hamlin, C. (Envirodyne Engineers, Inc., St. Louis, MO (USA)). 1 Jul 1980. Contract EPA-68-02-3178. 68p. NTIS, PC A04/MF A01.

This document illustrates the attainment/non-attainment designations for the five criteria pollutants (sulfur dioxide, total suspended particulates, ozone, carbon monoxide and nitrogen dioxide) for the states comprising USEPA - Region V (Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin). The air quality designations detailed in these maps are based upon information available as of July of 1980. For additional information regarding current air quality data, legal and procedural requirements for attainment areas, etc., the appropriate regional, state or local environmental agencies should be contacted.

5006 Regulations

REFER ALSO TO CITATION(S) 24857, 25606, 26147

26172 (DOE/PE/70278—T15) Relaxing environmental standards during oil-supply disruptions: past, present and future. Birdsall, T.H. (Harvard Univ., Cambridge, MA (USA). John Fitzgerald Kennedy School of Government). 13 Apr 1981. Contract AC01-80PE70278. 132p. NTIS, PC A07/MF A01. Order Number DE81024250.

During past oil supply disruptions pollution control regulations have been temporarily relaxed. In addition, the Clean Air Act was amended in 1977 to permit temporary variances from air pollution control regulations in the event of a national or regional energy emergency. However, neither actions taken in the past nor the present provisions of the Clean Air Act regarding the temporary relaxation of environmental standards have received much scrutiny. This paper attempts to fill this void by addressing the following two policy questions: (1) should environmental standards such as sulfur emissions limitations be relaxed during oil supply disruptions; and (2) if relaxing a particular standard appears desirable, when, where and how should it be relaxed. In answer to these questions, the argument is made that disruptions could suddenly result in marginal pollution abatement costs much greater than the benefits from, or demand for, the marginal improvement in air quality from such abatement - thereby justifying temporary variances. As a result, a set of criteria for evaluating variance policies are developed on the basis of both the theoretical rationale for variances and institutional or implementation considerations. After describing present federal variance policy, the developed criteria are used to evaluate current policy. Current federal variance policy is found to be inattentive to both the theoretical rationale for granting variances during oil supply disruptions and the salient characteristics of disruptions.

26173 (PB—81-118739) Guideline for use of city-specific EKMA in preparing ozone SIPS. Draft report. Gipson, G.L.; Freas, W.P.; Kelly, R.F.; Meyer, E.L. (Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards). Oct 1980. 107p. NTIS, PC A06/MF A01.

Report describes how to use the city-specific EKMA model as a means for estimating emission control requirements needed to demonstrate attainment of the ozone NAAQS in 1982 SIP's. Topics addressed include (1) use of air quality, meteorological and emissions measurements or estimates for generating ozone isopleth diagrams; (2) application of the ozone isopleth diagrams in estimating controls needed to attain the ozone NAAQS at each monitoring site; and (3) estimation of the city-wide control requirement for use in the SIP.

26174 (PB—81-118747) Ammonium sulfate manufacture - background information for promulgated emission standards. Final report. (Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards). Oct 1980. Contract EPA-68-02-3061. 22p. NTIS, PC A02/MF A01.

Standards of performance for the control of emissions from ammonium sulfate manufacture plants in the U.S. are being promulgated under Section 111 of the Clean Air Act. The standards apply to new, modified, or reconstructed facilities at caprolactam by-product, synthetic and coke oven by-product ammonium sulfate manufacturing plants.

26175 (PB—81-119455) Volatile organic compound (VOC) species data manual. Second edition. (Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards). Jul 1980. 465p. NTIS, PC A20/MF A01.

This document contains tables of potential emissions of organic compounds for selected source categories. The species profile table format has been organized to be particularly useful in preparation of emission inventory inputs to photochemical modeling. Accompanying each VOC profile table is a brief narrative that describes process, emissions, controls, and basis of source report and data quantification. The chemical classifications include paraffin, olefin, aromatic, carbonyl (aldehydes and ketones), methane, nonreactive other than methane, and miscellaneous. Data confidence levels for each profile table have been assigned. Reports, published data, and names and titles of personal contacts are referenced for each source category.

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

REFER ALSO TO CITATION(S) 25117, 25140, 26205, 26207, 26212, 26213, 26214, 26216, 26217, 26219, 26221, 26226

26176 (ORNL/TM—7759) Quantitative analysis of forest island pattern in selected Ohio landscapes. Bowen, G.W.; Burgess, R.L. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 121p. NTIS, PC A06/MF A01. Order Number DE81025496.

The purpose of this study was to quantitatively describe the various aspects of regional distribution patterns of forest islands and relate those patterns to other landscape features. Several maps showing the forest cover of various counties in Ohio were selected as representative examples of forest patterns to be quantified. Ten thousand hectare study areas (landscapes) were delineated on each map. A total of 15 landscapes representing a wide variety of forest island patterns was chosen. Data were converted into a series of continuous variables which contained information pertinent to the sizes, shape, numbers, and spacing of woodlots within a landscape. The continuous variables were used in a factor analysis to describe the variation among landscapes in terms of forest island pattern. The results showed that forest island patterns are related to topography and other environmental features correlated with topography.

26177 (PNL—3212) Raptors of the Hanford Site and nearby areas of southcentral Washington. Fitzner, R.E.; Rickard, W.H.; Cadwell, L.L.; Rogers, L.E. (Battelle Pacific Northwest Labs., Richland, WA (USA)). May 1981. Contract AC06-76RL01830. 69p. NTIS, PC A04/MF A01. Order Number DE81025119.

This report is concerned with the birds of prey which use the Hanford Site not only during the nesting season but throughout the year. An ecological treatment of five nesting owls (great horned, long-eared, short-eared, barn and burrowing) and five nesting hawks (marsh hawk, red-tailed hawk, Swainson's hawk, prairie falcon and American kestrel) is provided and supportive information on non-nesting species is presented. Factors which control raptor densities and population dynamics throughout all seasons of the year are discussed. Information is also provided for raptors from other areas of southcentral Washington in order to yield a comprehensive picture of how the Hanford Site fits in with regional bird of prey populations. The following were the objectives of this study: (1) to determine the numbers of birds of prey nesting on the Hanford Site, (2) to document the reproductive chronology of each nesting raptor species, (3) to provide analyses of food habits of birds of prey on the Hanford Site coupled with prey abundance data, (4) to determine the productivity of the dominant large birds of prey on the Hanford Site, (5) to determine the distribution and land use patterns of all raptors on the Hanford Site, (6) to determine the kinds and relative abundance of non-nesting raptors on the Hanford Site and adjacent areas of southcentral Washington (7) to document present land use practices on the Hanford Site and their effects on raptors, (8) to document radionuclide levels in birds of prey on the Hanford Site, and (9) to determine the role of birds of prey in radioecological monitoring.

26178 Terrestrial microcosms: what questions do they address. Ausmus, B.S.; Van Voris, P.; Jackson, D.R. (Battelle Columbus Labs., OH). pp 937-953 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Microcosms are laboratory experimental units used to investigate a variety of ecological associations, including interactions among ecosystem components, responses to stimuli, metabolic pathways, and ecosystem stability and complexity. One rapidly developing area of terrestrial microcosm application is risk assessment, i.e., the quantitative estimation of transport, fate, and effects of potentially hazardous substances and/or complex waste streams. The critical questions in this application of microcosm techniques, comparison of various designs, and probles in their use are the subjects of this review. Simultaneously addressing transport, biodegradation - transfomations, and ecological effects is a goal that would be cost effective and realistic. Several difficulties in using terrestrial microcosms remain. It remains cost inefficient and statistically primitive to include complete food-chain experimental units thus far developed. Mammals and avian species, however, would be optimally studied in an interactive experimental system. Field calibration or validation of results has only begun and still remains in the shadows. Finally, a reliable set of parameters, especially those addressing an array of ecological effects, has not been developed.

26179 Chemical evaluation: projected application of terrestrial microcosm technology. Gillett, J.W. (Environmental Protection Agency, Corvallis, OR); Witt, J.M. pp 1008-1033 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Terrestrial microcosm technology shows great promise in evaluating the fate and effects of pesticides and other toxic substances. Although problems, such as interlaboratory validation, demonstrated accuracy in the field or biome, development of operational and design criteria, and mathematical modeling, remain to be solved, progress has been substantial in demonstrating fate (transport, transformation, and bioaccumulation) and effects (toxicity and systems dysfunction). Current systems provide indexes, such as biodegradation and bioaccumulation indexes, and mass balance or accountability of toxicant. Applying microcosm technology to these ends alone, however, will not provide a long-term solution to

the evaluation of thousands of chemicals each year by government and industry. The National Science Foundation Workshop on Terrestrial Microcosms carried out a state-of-the-art review and assessment of protocol development that has resulted in the exposition of a long-term research thrust directed at applying microcosm technology, mathematical modeling, and the benchmark approach to chemical evaluation. Through a series of iterative modeling and testing steps, carefully integrated with use experience and including both health and ecological concerns, microcosms can be used to validate mathematial models derived from basic properties. As these steps improve the accuracy of predictions, testing requirements could be reduced to those necessary and sufficient to assess hazard or safety.

26180 **Microbial trophic structure and habitable pore space in soil.** Elliott, E.T. (Colorado State Univ., Fort Collins); Coleman, D.C.; Anderson, R.V.; Cole, C.V.; Hunt, H.W.; Woods, L.E.; Gould, W.D.; McClellan, J.F. pp 1050-1070 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Trophic transfer of nutrients immobilized in soil biomass is probably responsible for mineralization of much carbon, nitrogen, and phosphorus in ecosystems. Loss of respiratory carbon during trophic interactions contributes to the mineralization of nitrogen and phosphorus. Microbial trophic structure and available soil pore space influence rates of decomposition and mineralization. In recent experiments with sterilized soil inoculated with bacteria, the addition of grazing fauna (amoebae and nematodes) increased respiration rates, accelerated the return of NH_4^+ and PO_4^{3-} to the soil solution, and elevated the nitrogen concentration of plant shoots. The nematode (Mesodiplogaster) feeds on bacteria (Pseudomonas) as well as amoebae (Acanthamoeba) but grows best in the presence of amoebae. Respiration rates were higher when both grazers were grown with bacteria (food web) than when each grazer was grown singly with bacteria (simple food chain). It was hypothesized that one reason for increased nematode growth in the presence of amoebae might be that protozoa make food more available to nematodes by entering soil pores inaccessible to them, feeding on bacteria within the pores, and emerging as food otherwise unavailable to nematodes. An experiment using a fine-textured (with fewer habitable pores for nematodes) and a coarse-textured soil was designed to test this possibility. There was a greater proportional increase in nematode growth with amoebae in the fine than in the coarse soil. These results indicate that the type of trophic structure in relation to habitable pore space is important in energy flow and nutrient release in terrestrial ecosystems.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 26117, 26119, 26122, 26123, 26124, 26127, 26132, 26139, 26141, 26145, 26146, 26147, 26160, 26200, 26265, 26266, 26267, 26270, 26275, 26277, 26280, 26281, 26282, 26284, 26335, 26336, 26337, 26338, 26343, 26348, 26349, 26350, 26351, 26352, 26353, 26354, 26355, 26356, 26357, 26362, 26370, 26386

26181 (CONF-800365—, pp 104-105) **Acidity of Antarctic snow: a natural reference level for acid rains.** Delmas, R.J. (Laboratoire de Glaciologie et Geophysique de l'Environnement, Grenoble, France); Aristarain, A.; Legrand, M. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Sampling of snow and ice in Antarctica shows a correlation between acidity and climate change. This data may be used in comparisons for acid rain of other regions.

26182 (CONF-800365—, pp 110-111) **Impact of land-use on the chemical composition of rain and snow in northern Minnesota.** Eisenreich, S.J.; Thornton, J.D.; Gorham, E.; Munger, J.W. (Univ. of Minnesota, Minneapolis). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Land-use strongly affects acidity and composition of precipitation. Forested areas with exposed bedrock experience higher H^+ inputs than prairie or agricultural areas. Soil source dominates major and trace element composition of rain/snow in prairie and agricultural areas. Non-soil sources dominate trace element composition of rain/snow in forested areas. Snow cores exhibited higher acidity than rain/snow at forested, eastern site. Strong acid input to NE Minnesota occurs at levels known to cause deleterious aquatic impacts.

26183 (CONF-800365—, pp 160-161) **Use of radioactive tracers to study runoff and soil-water intereactions in natural mini-catchments.** Dahl, J.B. (Inst. for Energy Tech., Kjeller, Norway); Qvenild, C.; Tollan, O.; Christophersen, N.; Seip, H.M. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Tracer techniques of radioactive elements have been used to aid in more detailed studies of the behavior of ions found in runoff waters. Concentrations absorbed by soils and plant contact are also discussed.

26184 (CONF-800365—, pp 176-177) **Soil resampling and pH measurements after an 18-year period in Ontario.** Linzon, S.N.; Temple, P.J. (Ontario Ministry of the Environment, Toronto). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Resampling of soils was done in Ontario to gain more data in an attempt to understand more about the effects of acid precipitation. Since some areas are geographically more sensitive to acid rain than others, the drainage of acidified soils is being studied closely.

26185 (CONF-800365—, pp 182-183) **Acidification effect of urea and sulfur application on the forest soil in a percolation experiment.** Popovic, B. (Swedish Univ. of Agricultural Sciences, Uppsala). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A study was performed in Sweden to study acidification effects on soils through the movement of ground water and the rate at which it was absorbed into the soil. Various soil horizons were sampled for pH values and concentrations of urea and sulfur compounds.

26186 (CONF-800365—, pp 186-187) **Effects of artificial acidification with sulfuric acid on soil chemistry in a Scots pine forest.** Farrell, E.P. (Univ. College, Dublin, Ireland); Nilsson, I.; Tamm, C.O.; Wiklander, G. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A soil chemistry study was done on various soil horizons affected by simulated acidification using sulfuric acid. The data accumulated from the pine forest statistically showed that almost all sulfur remained within the soil horizons regardless of leaching.

26187 (CONF-800365—, pp 194-195) **Effects of acid precipitation on soil and forest. 3. Sulfate sorption by acid forest soils.** Singh, B.R. (Norwegian Forest Research Inst., Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Results from this study show that sulfur is leached and then accumulated in a sub-soil horizon. This shows that the sub-soil horizon has a higher resistance to leaching and tends to keep the sulfur bound to it depending on tempertures, moistures, and pH values.

26188 (CONF-800365—, pp 198-199) **Effects of acid precipitation on soil and forest. 5. Release and loss of nutrients from a Norwegian forest soil due to artificial rain of varying acidity.** Stuanes, A.O. (Norwegian Forest Research Inst., Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The release and loss of nutrients from the experimental soils was through leaching as a result of weathering and mineralization.

This was carried out as acid precipitation on the soils caused a decrease in the numbers of ion exchanges and less plant uptake.

26189 (CONF-800365—, pp 258-259) **Acid precipitation, throughfall chemistry and canopy processes.** Clesceri, N.L.; Vasudevan, C. (Rensselaer Polytechnic Inst., Troy, NY). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This report presents preliminary observations on throughfall chemistry. These data collected as part of an integrated lake/watershed study, will be analyzed and used in the development of a Canopy Effect Model. This model will be useful in analyzing throughfall quantity and quality as a function of meteorological data, air quality data, and incident precipitation chemistry.

26190 (CONF-800365—, pp 260-261) **Snow pack storage and ion release.** Johannes, A.H. (Rensselaer Polytechnic Inst., Troy, NY); Galloway, J.N.; Troutman, D.E. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Monitoring and sampling of atmospheric precipitations were carried out in the Adirondack Region of New York State. Filtering of samples provided a pH value, conductivity and ionic compositions. Snow pack storage contained higher nitrate concentrations than sulfates. In most other parts of the world, sulfate concentrations are greater than nitrates in snowpack.

26191 **(DOE/EV/02530—17) Sorption of pollutant gases by soils. Final report, December 1, 1974-November 30, 1980.** Bremner, J.M. (Iowa State Univ. of Science and Technology, Ames (USA)). Apr 1981. Contract AS02-76EV02530. 13p. NTIS, PC A02/MF A01. Order Number DE81023349.

The major objectives of this project were to study the ability of soils to sorb sulfur dioxide (SO_2), hydrogen sulfide (H_2S), nitrogen dioxide (NO_2), nitric oxide (NO), nitrous oxide (N_2O) and other pollutant gases, and to identify the mechanisms by which soils sorb these gases. The research performed showed that soils can sorb substantial amounts of SO_2, H_2S, and NO_2 by nonbological mechanisms and that the capacities of diverse soils for sorption of these gases can be predicted quite closely from consideration of selected soil properties. It also showed that soils sorb NO and N_2O only under anaerobic conditions and that soil microorganisms are responsible for sorption of these gases. Studies of the mechanisms by which soils sorb SO_2, H_2S, and NO_2 showed that most of the S retained by soils exposed to SO_2 is in the form of sulfate and sulfite, that most of the S retained by soils exposed to H_2S is in the form of elemental S and sulfate, and that most of the N retained by soils exposed to NO_2 is in the form of nitrate and nitrite. Research performed did not confirm recent work indicating that soils represent a major sink for atmospheric N_2O.

26192 **(IAEA-SM—254/63) Development and application of terrestrial food chain models to assess health risks to man and releases of pollutants to the environment.** Kaye, S.V.; Hoffman, F.O.; McDowell-Boyer, L.M.; Baes, C.F. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 39p. (CONF-810652—4). NTIS, PC A03/MF A01. Order Number DE81024127.

From International symposium on health impacts of different sources of energy; Nashville, TN, USA (22 Jun 1981).

This paper reviews the development and application of mathematical models used to predict the terrestrial food chain transport of pollutants of potential importance to human health. A distinction is made between models developed specifically for assessment applications and models which may function as research tools. Differentiation is also made between models whose structure is based on steady-state relationships among food chain compartments and dynamic models developed to simulate food chain and pollutant kinetics. The strengths and weaknesses of these models are related to the needs of the model user, the availability of relevant data for parameter quantification, and the feasibility for model validation. For assessment purposes, an optimum level of structural complexity will be achieved when all parameters are readily measurable and predictive error due to unforeseen correlations among parameters is small. The optimum level of simplification, however, will be determined by model validation results and the ease of model implementation. Most examples are derived from models used to assess the terrestrial food chain transport of radionuclides because assessment methodologies for other types of pollutants are only at an early stage of development. It is concluded that current limitations in parameter quantification and model validation will probably restrict most assessment applications of terrestrial food chain models to a type of screening calculation. However, once pollutant releases actually occur, environmental monitoring will be necessary to ensure that potential model misprediction does not result in unacceptable consequences.

26193 **Fate and behavior of pesticides in a compartmentalized microcosm.** Lichtenstein, E.P. (Univ. of Wisconsin, Madison). pp 954-970 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

A summary is presented of experiments conducted during the 3-year period from 1975 to 1978, leading to the development of a compartmentalized microcosm which has been used for the study of the movement and metabolism of pesticide chemicals in terrestrial and aquatic environments. Problems related to a particular test chemical can be studied in fallow or plant-covered soil, crop plants grown in the soil, run-off water containing soil particles, lake mud deposits, and various organisms within the aquatic part of the microcosm. Because of the relatively small size and cost of the stainless-steel apparatus experiments can be easily replicated. Model experiments were conducted with ^{14}C-phorate soil residues. The metabolism and movement of insecticide residues from soils into crops and the contamination of the aquatic system and its guppy fish and water ferns are reported. Problems of unextractable, soil-bound ^{14}C-insecicide residues were investigated with several soil types, and the mechanism of production of soil-bound residues of ^{14}C-parathion by microorganisms is discussed. By use of flooded soil systems, the movement and metabolism of ^{14}C-phorate as affected by layers of lake-bottom mud is describeed Phorate sulfoxide, an oxidative metabolite of phorate in agricultural soil, was microbiologically reduced to its more toxic parent compound in a soil-lake mud-water microcosm.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 25113, 25114, 25163, 25164, 25976, 26168, 26169, 26177, 26192

26194 (CONF-800438—, pp 76-93) **Investigations into ground climate as an alternative thermal building environment.** Labs, K. (Undercurrent Design Research, New Haven, CT); Harrington, K. 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

A mathematical model for estimating the temperature of a selected vertical profile in the soil, under undisturbed thermal conditions is described. The profile can be selected to correspond to the depth of placement of various subgrade walls. Synthesized profile temperatures for several different geographic regions are presented. Although this model cannot be used to predict heat loss in the form given, it is believed that it provides an expedient method for comparing the elements of above the below ground climates in the overall assessment of design alternatives. Some suggested uses of the model are presented, with particular reference to earth pipes and determining degree day assignments to different soil profiles.

26195 **(DOE/DP/00539—040) Selected radioisotopes in animal tissues in Nevada: ^{90}Sr and ^{137}Cs measurements from 1956 to 1977.** Smith, D.D.; Andrews, V.E. (Environmental Protection Agency, Las Vegas, NV (USA). Environmental Monitoring Systems Lab.; Environmental Protection Agency, Las Vegas, NV (USA). Office of Radiation Programs). Apr 1981. Contract AI08-76DP00539. 59p. (EPA/600/3—81-027). NTIS, PC A04/MF A01.

Since 1956 the Animal Investigation Program (AIP) has been conducting surveillance of domestic and wild animals on and

around the Nevada Test Site (NTS) and assessing the radionuclide burdens present in their tissues and any resulting pathological effects. Other AIP objectives were to investigate alleged dosage to animals, to maintain public information contacts with the off-site population, and to conduct special ad hoc investigations. Most of the radionuclide burden data and the AIP's history and evolution have been published in the annual reports of this program. Additional unpublished data were gleaned from the AIP historical files. This rather substantial body of radiological data has been reviewed and analyzed for trends with time and source of exposure. Because of the volume of data, only a summary has been included in the appendices of this report. The complete data are available in the AIP file for further study.

26196 **(DOE/DP/00539—042) Animal Investigation Program: Nevada Test Site and Vicinity. Annual report, 1979.** Smith, D.D.; Giles, Jr.; Bernhardt, D.E. (Environmental Protection Agency, Las Vegas, NV (USA). Environmental Monitoring Systems Lab.; Environmental Protection Agency, Las Vegas, NV (USA). Office of Radiation Programs). May 1981. Contract AI08-76DP00539. 72p. (EPA/600/3—81-035). NTIS, PC A04/MF A01.

Data are presented from the radioanalyses of tissues collected from cattle, mule deer, desert bighorn sheep, rabbits, chukar, golden eagles, and other wildlife that resided on or near the Nevada Test Site during 1979. Routine and special activities of the Animal Investigation Program are also discussed. Other than the naturally occurring potassium-40, gamma-emitting radionuclides were detected infrequently. Strontium-90 concentrations in bones from deer, cattle, and desert bighorn sheep were lower than those of recent years. Tritium concentrations were generally within expected environmental limits with the exception of animals exposed to known sources of contamination; e.g., drainage ponds from Area 12 tunnels or the Sedan Crater. Plutonium levels in all tissues from all species showed little variation to those levels in samples collected in recent years. Radionuclide tissue concentrations were generally higher in the tissues of animals residing in Area 15 than in similar animals collected from other Nevada Test Site areas. Hypothetical annual dose estimates to man were calculated on the basis of the daily consumption of 0.5 kilogra of liver or muscle from animals that contained peak radionuclide levels. The movements of 25 mule deer outfitted with collars containing a radio transmitter unit were monitored on a weekly basis. No gross or microscopic lesions were found in necropsied animals that could be directly attributed to the effects of ionizing radiation.

26197 **(DOE/UMT—0102) Engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah.** (Ford, Bacon and Davis Utah, Inc., Salt Lake City (USA)). Apr 1981. Contract AC04-76GJ01658. 209p. NTIS, PC A10/MF A01. Order Number DE81024471.

Ford, Bacon and Davis Utah Inc. has reevaluated the Vitro site in order to revise the April 1976 assessment of the problems resulting from the existence of radioactive uranium mill tailings at Salt Lake City, Utah. This engineering assessment has included the preparation of topographic maps, the performance of core drillings and radiometric measurements sufficient to determine areas and volumes of tailings and radiation exposures of individuals and nearby populations, the investigations of site hydrology and meteorology, and the evaluation and costing of alternative corrective actions. Radon gas released from the 1.9 million tons of tailings at the Vitro site constitutes the most significant environmental impact, although windblown tailings and external gamma radiation also are factors. The four alternative actions presented in this engineering assessment range from millsite and off-site decontamination with the addition of 3 m of stabilization cover material (Option I), to removal of the tailings to remote disposal sites, and decontamination of the tailings site (Options II through IV). Cost estimates for the four options range from about $36,400,000 for stabilization in-place, to about $91,000,000 for disposal at a distance of about 85 mi. Three principal alternatives for the reprocessing of the Vitro tailings were examined: heap leaching; treatment at an existing mill; and reprocessing at a new conventional mill constructed for tailings reprocessing. The cost of the uranium recovered would be about $200/lb by heap leach and $130/lb by conventional plant processes. Spot market price for uranium was $28.00 in November 1980. Therefore, reprocessing the tailings for uranium recovery appears to be economically unattractive at present.

26198 **(DOE/UMT—0102S) Summary of the engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah.** (Ford, Bacon and Davis Utah, Inc., Salt Lake City (USA)). Apr 1981. Contract AC04-76GJ01658. 84p. NTIS, PC A05/MF A01. Order Number DE81025225.

This report is a summary of a parent report (issued under separate cover) entitled Engineering Assessment of Inactive Uranium Mill Tailings for Vitro Site, Salt Lake City, Utah. Bacon and Davis Utah Inc. has reevaluated the Vitro site in order to revise the April 1976 assessment of the problems resulting from the existence of radioactive uranium mill tailings at Salt Lake City, Utah. This engineering assessment has included the preparation of topographic maps, the performance of core drillings and radiometric measurements sufficient to determine areas and volumes of tailings and radiation exposures of individuals and nearby populations, the investigations of site hydrology and meteorology, and the evaluation and costing of alternative corrective actions. Radon gas released from the 1.9 million tons of tailings at the Vitro site constitutes the most significant environmental impact, although windblown tailings and external gamma radiation also are factors. The four alternative actions presented in this engineering assessment range from millsite and off-site decontamination with the addition of 3 m of stabilization cover material (Option 1), to removal of the tailings to remote disposal sites, and decontamination of the tailings site (Options II through IV). Cost estimates for the four options range from about $36,400,000 for stabilization in-place, to about $91,000,000 for disposal at a distance of about 85 mi. Three principal alternatives for the reprocessing of the Vitro tailings were examined: heap leaching; treatment at an existing mill; and reprocessing at a new conventional mill constructed for tailings reprocessing. The cost of the uranium recovered would be about $200/lb by heap leach and $130/lb by conventional plant processes. Spot market price for uranium was $28.00 in November 1980. Therefore, reprocessing the tailings for uranium recovery appears to be economically unattractive at present.

26199 **(PB—81-116774) Environmental contaminants in food. Volume II-Part B: Working papers.** (Office of Technology Assessment (U.S. Congress), Washington, DC). Jan 1980. 557p. NTIS, PC A24/MF A01.

This volume contains working papers written for Office of Technology Assessment (OTA) to assist in preparation of the report Environmental Contaminants in Food. The contents include: (1) Toxic substances in food information systems: design and management; (2) Assessment of carcinogenic risks from PCBs in food; (3) Economic analysis of alternative action levels in the regulation of environmental contaminants in food; (4) Analysis of foods for radioactivity; (5) Approaches to monitoring environmental contaminants in food; (6) Analytical systems for the determination of metals in food and water supplies; (7) Assessment of methods for regulating 'unavoidable' contaminants in the food supply; and (8) Consumer risk from environmental contaminants in food.

26200 **(UCRL—50027-80) Environmental monitoring at the Lawrence Livermore National Laboratory: 1980 annual report.** Toy, A.J.; Lindeken, C.L.; Griggs, K.S.; Buddemeier, R.W. (Lawrence Livermore National Lab., CA (USA)). 15 Apr 1981. Contract W-7405-ENG-48. 72p. NTIS, PC A04/MF A01. Order Number DE81025124.

The results of environmental monitoring for 1980 at the Livermore National Laboratory are presented. Radioactivity in air, soil, sewage, water, vegetation and food, and milk was measured. Noise pollution, beryllium, heavy metals, and pesticides were monitored. (ACR)

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 25106, 26283

26201 (CONF-800365—, pp 367-369) **Historical land-use changes related to fish status development in different areas of southern Norway.** Drabloes, D.; Sevaldrud, I.; Timberlid, J.A. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Systematical relations between changes in land use, and regional lake acidification trends and fish population decreases are discussed. None of the relations were found to affect each other.

26202 (CONF-800438—, pp 189-197) **Taxonomy of underground space.** Baggs, S.A. 1980. NTIS, PC A11/MF A01.

From Earth sheltered housing conference and exhibition; Minneapolis, MN, USA (9 Apr 1980).

A taxonomy of underground space is suggested in 7 steps. They are: geospace or architectural space; geotecture or geodoid space; terratecture or lithotecture; above or below/grade for terratecture or above or below/grade for lithotecture and this step is further divided into these types: (1) chamber, atrium, elevational, penetrational for above or below/grade for tenatecture; and (2) chamber, sink/atrium, open shelter, air shafts for above or below/grade for litholecture; passive or active; and the final step, static or transit space. Examples of taxonomic classification are presented.

26203 **Microcosm evaluation of the agricultural potential of fly-ash-amended soils.** Malanchuk, J.L.; Mueller, C.A.; Pomerantz, S.M. (State Univ. of New York, Plattsburgh). pp 1034-1049 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

The potential utility of fly-ash-amended agricultural soils was evaluated in 76-liter terrestrial microcosms, 42 cm high and 20 cm in diameter. Birdsfoot trefoil, Lotus corniculatus L. Viking, was grown in a control microcosm and three experimental treatments of 224, 448, and 672 tonnes fly ash/ha under greenhouse conditions, with five replicates per treatment. Microcosms were equipped with drains to allow comparison of leaching losses of B, Zn, Mn, Mg, Ca, Na, and K between treatments. Plants were harvested after 82 and 139 days, and tissue elemental concentrations were determined. Coal fly-ash amendment alters the physical properties of soil and is a potential lime substitute because of its alkaline nature and a micronutrient supplement because of its high metal content. Problems associated with metal contamination of drainage waters and plant toxicity appear minimal. Microcosms of a depth sufficient to represent the plow layer are adequate to simulate much of the disturbance created by fly-ash amendment of field soils. Microcosm results, useful in themselves as a means of assessing the effects of man-induced system modification, provide essential direction in reducing the number of costly field trials.

5106 Regulations

REFER ALSO TO CITATION(S) 25629, 25630, 26147

52 ENVIRONMENTAL SCIENCES, AQUATIC

26204 (CONF-800365—, pp 238-239) **Acidification of Danish soft-water lakes.** Rebsdorf, A. (Freshwater Lab., Silkeborg, Denmark). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The present study indicates that some Danish soft-water lakes are getting acidified. Over long periods of time (12 to 25 years) pH has decreased up to 1 unit in some lakes. Even during the shorter 3 to 4 year period of the present study there is a tendency towards decreasing alkalinity in slightly alkaline lakes.

5201 Basic Studies

REFER ALSO TO CITATION(S) 26290, 26394, 26396

26205 (CONF-800365—, pp 284-285) **Water residence distributions.** Christophersen, N. (Central Inst. for Industrial Research, Oslo, Norway); Brustad, K.; Dahl, J.B.; Gulliksen, T.; Njoes, A.; Qvenlid, C.; Seip, H.M.; Tollan, O. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Experimental hydrologic and soils data were used in a flow model water residence analysis. Calculations of water residence and water movement were made using tritium as a label to obtain plots.

26206 (CONF-800365—, pp 370-374) **Experimental acidification of a whole lake: a test of the oligotrophication hypothesis.** Schindler, D.W. (Univ. Crescent, Winnipeg, Manitoba). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The hypothesized oligotrophication as the result of acidification was examined experimentally in a whole-lake acidification experiment. Down to pH 5.6, no oligotrophication was observed. Phosphorus and nitrogen concentrations were not affected by acidification, despite the fact that large mats of algae covered the sediment surface in littoral areas. Phytoplankton biomass and production did not decrease after acidification. Despite constant dissolved organic carbon and increased phytoplankton, transparency of the lake increased, presumably due to a change in color of dissolved organic substances. The few changes observed in animals were due to direct toxic effects rather than lower productivity. Data suggest that there are three possible reasons for the observations: (1) oligotrophication does not occur until pH values are lower than 5.6; (2) the combination of acid and heavy metals from acidified terrestrial watersheds is responsible for the oligotrophication observed in past studies; and (3) that some of the apparent oligotrophication effects may be illusory, due to major changes in community composition rather than decreases in productivity per se. It is hoped that the matter can be tested in subsequent years of lake manipulation.

26207 **(DOE/EV/01599—T1(Pt.1)) Dissolved organic matter and lake metabolism: biogeochemistry and controls of nutrient flux dynamics in lakes. Technical progress report, 1 July 1980-1 June 1981.** Wetzel, R.G. (Michigan State Univ., Hickory Corners (USA). W.K. Kellogg Biological Station). 1981. Contract AS02-76EV01599. 47p. (COO—1599-202(Pt.1)). NTIS, PC A03/MF A01.

These continuing investigations focus on integrated studies of the qualitative and quantitative cycling and metabolism of particulate and dissolved organic carbon in lakes and their inflow sources (surface and subsurface). Emphasis is placed on the sources, fates, and interactions of dissolved and particulate organic matter in relation to: inorganic chemical cycling, allochthonous loading to the lake system, and the coupled nutrient physiology and metabolism of phytoplankton, bacterial populations, macrophytes, and attendant sessile algal-bacterial communities. Regulatory mechanisms of growth and rates of carbon and nutrient cycling are being evaluated among the inorganic-organic influxes of allochthonous sources as they are controlled by wetland-littoral communities, the littoral photosynthetic producer-decomposer complex, and the microflora of the pelagial zone. The integrated studies addressing these multifaceted objectives are summarized in a detailed outline.

26208 **(DOE/EV/01599—T1(Pt.3)) Differential effects of growth and loss processes in controlling natural phytoplankton populations.** Crumpton, W.G. (Michigan State Univ., East Lansing (USA). Dept. of Botany and Plant Pathology). 1980. Contract AS02-76EV01599. 61p. (COO—1599-22(Pt.3); COO—1599-178). NTIS, PC A04/MF A01.

Thesis.

An investigation was made of factors controlling algal succession in a small, oligotrophic lake during summer stratification. Weekly measurements were made of growth rate, sedimentation rate, and population density for each of the dominant phytoplankton species. Weekly diel measurements were made of zooplankton grazing rates using ^{14}C labeled algae. Cyclotella michiganiana was the dominant algae through the end of June at which time Cyclotella comensis began to increase, becoming the dominant by

August. In August, high grazing pressure caused the rapid declines of both C. michiganiana and C. comensis which were followed by an increase of Sphaerocystis Schroeteri. The combined effect of greater growth rates and lower loss rates of C. comensis resulted in its dominance over of C. michiganiana. In contrast, the C. comensis - S. Schroeteri succession clearly resulted from differential mortality alone. It is likely that the importance of losses due to sedimentation and/or grazing is large in many lakes and that interspecific competition may be less important in actually controlling seasonal succession.

26209 (DOE/EV/01599—T1(Pt.4)) Littoral-pelagial interactions: the role of dissolved humic materials. Stewart, A.J. (Michigan State Univ., East Lansing (USA). Dept. of Botany and Plant Pathology). 1980. Contract AS02-76EV01599. 142p. (COO—1599-202(Pt.4); COO—1599-188). NTIS, PC A07/MF A01.

Thesis.

Relationships between ultraviolet absorbance, fluorescence, and concentrations of dissolved organic carbon (DOC) were examined in four model humic materials. Fluorescence was consistently a poor predictor of DOC concentration, and absorbance correctly predicted DOC concentration only in the more labile materials. Asymmetry between DOC and the two optical parameters was related to dissolved organic matter (DOM) apparent molecular weight, and could be explained by greater levels of internal quenching and shielding in compounds of larger apparent molecular weight. A lake-to-lake comparison demonstrated a calcium-related selective loss of high molecular weight dissolved humic material (DHM), which invalidates the use of either optical parameter as a good predictor of DOC concentration in hardware systems. However, fluorescence-absorbance ratios may be useful in delineating seasonal and depth distribution patterns of low and high molecular weight DHM within a given lake. Under controlled conditions, sediment/pH state markedly influenced the apparent molecular weight spectrum of selected DHM. Field and laboratory data indicate that organic-rich sediment absorbs DHM of high apparent molecular weight leaching from scenscing littoral vegetation during rain events, and slowly releases DHM of lower apparent molecular weight between rain events. Mixed natural assemblages of algae and bacteria generally demonstrated lower rates of ^{14}C assimilation and high rates of dissimilation of recent photosynthate when amended with low concentrations (7.2 mg l^{-1}) of unfractionated DHM, and the extent of the inhibition or stimulation was greatest in the smaller (1 to 5 μm) assemblage particles. In different assemblage types, additions of DHM markedly enhanced community alkaline phosphatase activity, particularly under low-light regimes.

26210 (DOE/EV/01599—T1(Pt.5)) Publications of the Lawrence Lake ecosystem investigations. Wetzel, R.G. (Michigan State Univ., Hickory Corners (USA). W.K. Kellogg Biological Station). 1981. Contract AS02-76EV01599. 37p. (COO—1599-22(Pt.5)). NTIS, PC A03/MF A01.

Intensive studies of Lawrence Lake were initiated in 1966, most of which were directed to specific experimental and population analyses of the pelagial zone and basic physical and chemical features. A routine (weekly) monitoring program was initiated in mid-1967 and has continued uninterrupted since. This massive data set provides one of the most detailed long-term limnological analyses in existence on a worldwide basis. A listing of publications from the Lawrence Lake ecosystem studies is presented.

26211 (SRO-NERP—3) Freshwater bivalve mollusca (unionidae, sphaeriidae, corbiculidae) of the Savannah River Plant, South Carolina. Britton, J.C.; Fuller, S.L.H. (Savannah River Ecology Lab., Aiken, SC (USA); Texas Christian Univ., Fort Worth (USA). Dept. of Biology; Academy of Natural Sciences of Philadelphia, PA (USA)). Nov 1980. Contract AC09-76SR00819. 43p. NTIS, PC A03/MF A01. Order Number DE81022084.

A guide to freshwater bivalve molluscs found at the Savannah River Plant is presented. A dichotomous taxonomic key is provided to common forms and to unreported species whose geographic distributions include nearby localities. Discussions of ecology, life history, larval hosts, and other pertinent information is provided. (ACR)

26212 Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980). 1140p. (CONF-781101—). NTIS, PC A99/MF A01.

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

All of the forty-nine papers were abstracted and indexed individually for ERA/EDB. Author and subject indexes are also included. (JGB)

26213 Microcosmology: theoretical applications of biological models. Leffler, J.W. (Ferrum Coll., VA). pp 14-29 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Microcosms are defined as small, living models of ecosystem processes. The validity of any model can be judged only in terms of the purpose for which it is designed. The author views microcosms as models of ecosystem-level processes and not as simulations of specific ecosystems. A model can be designed for either prediction or understanding. Only models designed for increasing understanding of ecosystem dynamics are discussed. Either an inductive exploratory approach or a deductive hypothesis-testing approach can be followed. Formulating operational definitions of abstract concepts, devising alternative hypotheses, designing experiments, and choosing parameters and analytical procedures must be done carefully, as dictated by the purpose of the study and the extent of the model's validity. Speculations concerning future directions in theoretical microcosm research are exemplified by a multiparameter study of ecosystem nutrient-flux dynamics. A second sample is provided by research that couples systems-analysis techniques with empirical microcosm-derived data to test mathematical predictions of ecosystem behavior.

26214 New paradigm for the examination of closed ecosystems. Maguire, B. Jr. (Univ. of Texas, Austin); Slobodkin, L.B.; Morowitz, H.J.; Moore, B. III; Botkin, D.B. pp 30-68 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Several theoretical statements and developments have resulted from consideration of the effects of closure on a portion of an ecosystem, of the difficulties of gaining adequate information about an ecosystem's function without significantly changing the system, and of some current approaches to ecosystem function, analysis, and modeling. In the first place, there is a fundamental limit to the amount of understanding of the function of a system which is derivable from data gathered from that system. This limit is determined by the degree to which the data-gathering process intrudes on the system's function. For ecosystems this results in an ecological uncertainty principle. Its magnitude is system, sensor, and system-descriptor specific. Secondly, in attempting to reduce the ecological uncertainty about the function of ecosystems, we have developed a system descriptor that uses adequate infomation but requires relatively modest interference with the system's processes to acquire that information. This descriptor has two interrelated parts: a species list, in which the name of each species is explicitly taken to include the great amount of ecological physiological, evolutionary, and other information available (or potentially available) about the species, and a reduced state vector, which includes quantitative estimates of some small number of species populations, material compartments, flows of energy and/or matter, and environmental factor levels in the system.

26215 Synthesizing aquatic microcosms. Taub, F.B.; Crow, M.E. (Univ. of Washington, Seattle). pp 69-104 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Synthetic microcosms consisting of glass containers partially filled with artificial lake water, artificial sediment, and a community of selected algae and grazers demonstrated expected and reproducible ecological processes. Most of the ten algal species grew, competed, and were grazed down by the increasing Daphnia population. After the algal populations were depleted, the Daphnia popu-

lations declined; then another algae-Daphnia bloom sequence occurred. The use of a complex sediment having clays and additional organic materials resulted in more eutophic conditions, with greater algal blooms and different dominating algal species. Daphnia populations reached greater peaks and maintained denser populations. The greater abundances were associated with greater statistical variances. Statistical differences between the treatment groups could be demonstrated because replicates within each treatment showed similar responses. Sequential tests of control conditions demonstrated that the timing of algae-Daphnia interactions was similar, but magnitude differed. Simultaneous controls should be run, as with all bioassays. The technique shows promise of providing a multitrophic-level bioassay that could be performed in laboratories independent of local biota, water, and sediment. Since a mathematical model indicated that community structure would influence the responses to stress, it was concluded that synthetic microcosms may allow better control of community structure and hence more reproducible results than do naturally derived microcosms.

26216 **Making microcosms an effective assessment tool.** Harte, J.; Levy, D.; Rees, J.; Saegebarth, E. (Univ. of California, Berkeley). pp 105-137 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Ecosystem microcosms can be effective tools for environmental-impact assessment only to the extent that standardized procedures for their design, initiation, and operation can be developed. These procedures must lead to systems that replicate and behave like either a specific natural system or a generic model of natural systems. Studies carried out over 3 years with freshwater lake-like microcosms ranging in size from 2 to 700 liters were directed toward understanding and improving the effectiveness of microcosms. The systems contained a diverse assemblage of biota, initially obtained from natural lakes. In analyzing the usefulness of these systems, the focus was on the following points: the importance and use of dynamic behavior (e.g., plankton blooms and decomposition activities) in these systems; surface-growth problems and their mitigation; adaptations of the biota to prolonged existence in a laboratory environment; influence of container size and initiation strategy on replicability and realism; perturbation studies involving introduction of potentially toxic substances; and problems of including macrofauna, such as fish, in laboratory systems.

26217 **Microcosms in ecological modeling.** Hill, J. IV; Wiegert, R.G. pp 138-163 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Understanding the role of microcosms in ecological modeling requires viewing microcosms either as physical models (analogs) of ecosystems or as actual ecosystems in a laboratory environment. For either point of view, research objectives associating microcosm experiments with ecosystem theory or analysis include: identifying holistic or system-level properties; identifying general ecosystem behavior; characterizing transport and transformation of materials; developing mathematical models and other analytical techniques; generating and testing hypotheses about ecosystem theory; and distinguishing structure - function relationships in ecosystems. These research objectives are realized through conceptual schemes that relate microcosms, ecosystems, models, and theory in different ways. The four most common conceptual approaches can be identified by their starting points. These are microcosm observations, basic process descriptions, ecosystem observations, and metatheories, such as general systems theory and cybernetics. Explicit recognition of the role of modeling in formulating microcosm research objectives will enhance the value of microcosms in ecological research.

26218 **Some cautions in applying results from aquatic microcosms.** King, D.L. (Michigan State Univ., East Lansing). pp 164-191 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Physical, chemical, and biological interactions of importance in microcosm design and operation are considered. Special attention is given to the use of microcosms to evaluate interactions between multiple nutrient limitation of bacterial and algal activity and various buffers in waters perturbed by the addition of a variety of waste materials. Buffers considered include organic and mineral acids and bicarbonate - carbonate alkalinity in systems ranging from acid strip-mine lakes to hypereutrophic, alkaline sewage lagoons. Emphasis is placed on the effect of the organism on the buffer and the feedback control of the buffer on the organism. Comparison of microcosm and field results is presented for some systems, and cautions are suggested for applying microcosm results in other systems.

26219 **Microcosm approach to the study of biogeochemical systems. I. Theoretical rationale.** Schindler, J.E.; Waide, J.B.; Waldron, M.C.; Hains, J.J.; Schreiner, S.P.; Freedman, M.L.; Benz, S.L.; Pettigrew, D.R.; Schissel, L.A.; Clark, P.J. pp 192-203 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Microcosms have been used extensively in ecology as model systems for elucidating basic ecosystem processes and for characterizing ecosystem responses to various applied perturbations. Such approaches, however, were often based on incomplete appreciation of ecosystems as biogeochemical systems, thereby complicating interpretations of microcosm results. A complete understanding of the responses of natural and model ecosystems to physical, chemical, and biological perturbations must be based on analyses of complex couplings between geochemical and biochemical components of ecosystems. The conceptual integration of such complex processes can best be effected by hierarchial analyses of response frequencies of observable ecosystem behaviors. A realistic approach to the examination of hierarchial ecosystem behaviors can be found in the analysis of trajectories of appropriate state variables in biogeochemical phase space. Such a phase space for biogeochemical systems can be developed using pH (-log proton activity) and pE (-log electron activity), the two master variables of chemcal equilibrium analyses. Since these two variables reflect coupled behaviors of geochemical and biochemical components of ecosystems, analyses of system trajectories in pH-pE phase space should accurately depict dynamic behaviors of entire ecosystems and should delimit boundaries of ecosystem responses in nominal and perturbed conditions. Analyses of perturbation responses of natural and model ecosystems are meaningless without such system-level information. The advantages of this hierarchial phase-space approach to biogeochemical systems are elaborated and contrasted with other more traditional approaches.

26220 **Microcosm approach to the study of biogeochemical systems. 2. Responses of aquatic laboratory microcosms to physical, chemical and biological perturbations.** Waide, J.B.; Schindler, J.E.; Waldron, M.C.; Hains, J.J.; Schreiner, S.P.; Freedman, M.L.; Benz, S.L.; Pettigrew, D.R.; Schissel, L.A.; Clark, P.J. (Clemson Univ., SC). pp 204-223 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

The dynamic behavior of a series of freshwater laboratory microcosms was investigated as a partial test of a theoretical rationale according to which ecosystems are viewed as hierarchical biogeochemical systems. Microcosms were established with Hoagland's growth medium and inoculated with a mixed-species laboratory culture. Ecosystem-level dynamics were assessed in pH-dissolved oxygen (DO) phase space, DO being used as an indicator of electron activity (pE) in the aerobic study systems. Other variables measured included conductivity, temperature, chlorophyll fluorescence, turbidity, select ionic concentrations, and abundances of all algal taxa present. After initial characterization of physicochemical system dynamics in the abiotic culture medium, microcosms were inoculated and maintained in a well-stirred condition, on a 12:12 h light-dark cycle in a 15°C environmental chamber. After a period of initial rapid growth, microcosms reached apparent steady

states in pH-DO phase space. At this point replicated sets of microcosms were perturbed physically (no stirring, 3:21 h light-dark cycle), chemically (titration to pH 6.0), or biologically (addition of herbivores). Systems were monitored until new apparent pH-DO steady-state behaviors were observed. Perturbations were then relaxed, and system dynamics were again tracked. Results showed that microcosm dynamics were confined to definable regions of pH-DO phase space, independent of specific taxonomic composition. Implications of these experiments are discussed in relation to the underlying theoretical rationale.

26221 Large-scale microcosms for assessing fates and effects of trace contaminants. Bowling, J.W.; Giesy, J.P.; Kania, H.J.; Knight, R.L. (Savannah River Ecology Lab., Aiken, SC). pp 224-247 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Large-scale microcosms have an important and necessary role to play in the study of the complex functioning and coupling of ecosystems. They can act best as a bridge between noninteractive laboratory tests and complex, highly interactive field experiments or monitoring programs. There is conceptual danger in extrapolating directly from model ecosystem data to natural systems, however. Therefore microcosm design requires: careful analysis of underlying assumptions; development of an appropriate hypothesis; formulation of appropriate questions and/or problems to be answered; and systematic assessment of all components before operation. Research experiences at the channels microcosms at the Savannah River Plant suggested guidelines to direct research at the facility. The channels microcosm was used in fate studies as an integrated system for verifying and validating predictive models for which uptake mechanisms and coefficients have been determined in more specific experiments. The system is not appropriate for studies to determine mechanisms and transfer coefficients or to conduct toxicological studies. Microcosms need not be structured to mimic natural ecosystems precisely, but they should be complete enough to exert selective pressure on all major functional groups and thus prevent erroneous results caused by compensatory behavior of the various populations involved. The attempt to restrict the biotic complexity of the channels by limiting the abiotic structural richness (substrate, water quality, macrophyte development, etc.), and thus engineer a natural microcosm without compromising valuable interactive terms, was not successful because of secondary effects that could not be factored out. It is felt that microcosms should be allowed to self-design or colonize and achieve dynamic equilibrium by establishing a number of interacting functional groups.

26222 Types of aquatic microcosms and their research applications. Giddings, J.M. (Oak Ridge National Lab., TN). pp 248-266 of Microsms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Aquatic microcosm research has developed along two basic lines, the model ecosystem and the model food chain. Originally used mainly to test ecological hypotheses, microcosms are now finding applications in assessing environmental effects of human activities, particularly chemical pollution. A critical problem today is selection of appropriate microcosm types for different research needs. Model ecosystems are used for studying community- or ecosystem-level phenomena, such as diversity, stability, nutrient cycling, and energy flow, under controlled conditions. Model food chains, which are simpler and easier to analyze but less realistic than model ecosystems, are applicable to studies of population dynamics, interspecific competition, predator - prey interactions, and trophic dynamics. In contaminant research, microcosms are more useful as predictive tools than as screening tools.

26223 Oxygen uptake and production in sediment-water microcosms. Neame, P.A.; Goldman, C.R. (Univ. of California, Davis). pp 267-278 of Microsms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Independent measurements of each source and sink of oxygen in the sediment were used as the input for a computer model of both the time course of uptake and production and the spatial distribution of oxygen in sediment-water microcosms. Comparisons of model predictions with measured uptake rates in microcosms under a variety of experimental conditions were used to determine the relative importance of several categories of supply and demand. Macrofauna respiratory activities were responsible for 60% of the total movement of oxygen into the sediment, whereas physically generated eddy diffusion was responsible for an additional 30%. The balance was attributable to molecular diffusion was responsible for an additional 30%. The balance was attributable to molecular diffusion of oxygen across the interface. Once in the sediment, 49% of the oxygen was consumed by microbiota, 42% by chemical oxidation of reduced compounds, and only 9% by macrofauna respiration. Comparisons of observed and predicted spatial distributions of oxygen in the cores indicated that the major weakness of the model lay in the inadequacy of its description of turbulence at the sediment - water interface.

26224 Heavy-metal and nutrients effects on sediment oxygen demand in three-phase aquatic microcosms. Medine, A.J. (Univ. of Connecticut, Storrs); Porcella, D.B.; Adams, V.D. pp 279-303 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Three-phase aquatic microcosms currently in use at the Utah Water Research Laboratory have been used to investigate a variety of environmental problems, such as trace-metal interactions and toxicity, nutrient dynamics, element cycling, nutrient inactivation (by aluminum sulfate), and microbiological community response. The microcosms contain 3.0 kg of lake sediment, 9.01 liters of aqueous medium, and a 0.51 liter gas phase and serve as physical models of hypolimnetic regions of lakes and reservoirs. They were operated in the dark for 5 to 12 months with a semicontinuous flow of synthetic medium. A mass-balance approach allowed identification of how biological, chemical, and physical variables are affected by their environment, transfer between phases, and, in turn, affect the overall composition of the aquatic microecosystem. For example, continuing research has shown that the hypolimnetic microcosms provide an accurate estimate of the O_2 demand exerted by aquatic sediments. The O_2 demand was linear ($0.974 \leq r^2 \leq 0.998$) over the duration of the experiments. Estimates of O_2 demand were replicable and sensitive with respect to microcosm inputs. Three separate studies with Hyrum Reservoir sediments revealed an O_2 demand of 0.12 +- 0.008 g O_2/m^2/day at 12°C (n = 3) in control microcosms. Lake Powell sediments (which are lower in organic content) exerted a lower O_2 demand (0.067 g O_2/m^2/day at 12°C). Treatments of Zn, Cr, Cd, Pb, and Hg at concentrations near the drinking water standards set by the Environmental Protection Agency significantly reduced O_2 demand in Lake Powell microcosms by 8 and 28%. Although inputs of metals were identical, the differences were related to a pH perturbation affecting metal adsorption, solubility, and interstitial metal concentration. In the same study, reduced photosynthesis and respiratory rates were observed and quantified.

26225 Some patterns in post-closure ecosystem dynamics (failure). Maguire, B. Jr. (Univ. of Texas, Austin). pp 319-332 of Microsms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Aliquants of three different aquatic communities containing microcrustacea as their largest animals were glass sealed in flasks. Longevity of the biological system was community specific and depended on aliquant size. Additional food, limited additional environmental heterogeneity, and the presence of refuges usually had little effect on longevity. Crustacea in the smallest aliquants of all communities became extinct rapidly; the number of replicates containing living individuals decreased after a declining exponential pattern. Crustacea in all larger aliquant sizes of one community perished essentially synchronously, possibly as a result of an increased CO_2 concentration.

26226 Are microcosms useful for ecosystem analysis. Heath, R.T. (Kent State Univ., OH). pp 333-347 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

By the use of general system theory, a procedure is developed to determine the extent to which the general behavior of laboratory microcosms is comparable to large-scale ecosystems. This procedure - experimental state-space analysis - is demonstrated on a small aquatic microcosm. Comparison of the microcosm behavior with reported field studies suggests that microcosms (at least those of the sort investigated) may well serve as heuristic tools; however, their ability to predict ecosystem events is doubtful.

26227 Inorganic carbon limitation during ecological succession in aquatic microcosms. Fraleigh, P.C.; Dibert, P.C. (Univ. of Toledo, OH). pp 369-401 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Results of studies of ecological succession in microcosms indicate that rates of growth of biomass can be limited by the availability of inorganic carbon. Microcosm succession was studied in mediums lacking inorganic carbon and having different concentrations of phosphorus and in mediums having different concentrations of carbon. During successions in different mediums, biomass and chlorophyll standing crops increased over the period of the study and chlorophyll standing crops leveled off. The standing crop at which chlorophyll leveled off was related to the phosphorus content of the medium, and biomass growth rates were at times related to the standing crop of chlorophyll, the rate of CO_2 diffusion from the atmosphere, and the inorganic carbon content of the medium. These times included the onset of succession and later in succession if standing crops of chlorophyll were great. In addition, CO_2 diffusion into the microcosms occurred at a rate sufficiently great to preclude measurement of rates of production and respiration from diurnal changes in the inorganic carbon content of the water.

26228 Steady-state zooplankton community in a feedback culture system. Hirata, H.; Yamasaki, S. (Kagoshima Univ., Kagoshima City, Japan). pp 402-415 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

An attempt was made to maintain a steady-state zooplankton community in a feedback culture system. A transparent, round, 550-liter tank connected to a 150-liter zigzag stream unit was used to multispecies culture of Brachionus plicatilis and Tigriopus japonicus. The water in the system was recirculated about 20 times per day by air-lift pumps. Animals were fed frozen baking yeast daily, and feces were removed from the bottom of the stream and transferred into the sludge activator. Marine Chlorella cultured in the sludge were then fed back to the zooplankton. Approximately 10 to 20% of the animals were harvested each day of the 480-day experiment. The relative proportion of B. plicatilis and T. japonicus in the community was maintained in a steady-state ratio of 82:18 by body volume. The proportion of nauplii, copepodites, and adults of T. japonicus was also constant during the culture period at a ratio of 28:47:25, respectively. The food-conversion efficiency was calculated to be 26.7%.

26229 Laboratory aquatic microcosms. Bretthauer, R. (Konstanz Univ., Germany). pp 416-445 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Several studies are examined to evaluate the utility of laboratory aquatic microcosms. The effects of biotic and abiotic factors, such as light, aeration, temperature, current velocity, and organic and inorganic stress were controlled in the succession and biocoenosis of protozoa and small microinvertebrates. The effects of current velocity, pesticides, and species composition on productivity and community structure were studied, and the succession and biocoenosis were compared with those of natural systems. Changes in pH, O_2, CO_2, NH_4^+-NH_3, NO_2^-, NO_3^-, and PO_4^{3-} were monitored.

26230 Microbiocoenoses in an Antarctic pond. Dillon, R.D.; Bierle, D.A. (Univ. of South Dakota, Vermillion). pp 446-457 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Forty-eight species of ciliates, representing 40 genera, 23 families and 8 orders, were identified when cored benthic samples concentrated on membrane filters were counted during an austral summer study at Coast Lake, Antarctica, in 1967-1968. On the basis of numbers of organisms, ciliates were the predominate faunal group in the lake, making up 86.8% of the total. The next most common groups were rotifers (7.9%), tardigrades (4.7%), and nematodes (0.6%). Data presented here support the scheme proposed by Picken (1937) which states that a microbiocoenosis of an algae-mat community structure, although demonstrating a great variety of ciliate species, usually attains a feeding structure where they are represented by about 58.8% strict herbivores, 34.7% variable feeders, and 6.4% carnivores. The presence of factors important for the suitable growth of algae (e.g., high dissolved oxygen, low free CO_2, and high pH in Coat Lake) did not appreciably alter the percentages of the ciliates in the three feeding groups in the 6-week seasonal study (December 14, 1967 to January 29, 1968) despite drastic environmental changes.

26231 Use of microcosms in studying decomposition processes in sewage sludge. Mitchell, M.J.; Hornor, S.G.; Abrams B.I. (State Univ. of New York, Syracuse). pp 458-472 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Sludge degradation and stabilization are accomplished by a complex of biotic and abiotic interactions, and the role of specific components can be readily studied with the use of microcosms. Previous work with microcosms established the importance of introduced macroinvertebrates in accelerating sludge stabilization. Glass-bead microcosms were used to ascertain the potential role of bacterial-nematode interactions on sludge decomposition and to determine energetic and population parameters of these two groups, which are dominant biotic components of drying beds and sludge-amended soils. Intact sludge cores were used to assess the effect of oxygen and nitrate, an alternate electron acceptor, on certain aspects of aerobic and anaerobic decomposition. Use of microcosms in studying decomposition processes of sludge is discussed, and the potential of microcosms for both basic and applied ecological investigations is emphasized.

26232 Use of microcosms in the study of habitat changes caused by the growth and perturbation of a water hyacinth community. Schreiner, S.P. (Clemson Univ., SC). pp 473-488 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Water hyacinth [Eichhornia crassipes (Mart.) Solms] often causes undesirable physicochemical changes in aquatic ecosystems, and considerable effort has been expended to control its populations with herbicides. Microcosms were used to study water hyacinth communities during normal growth and after herbicide treatment. Plants were grown in 300-liter tanks over 4 months to study the physicochemical consequences of herbicide application and uncontrolled water hyacinth growth in aquatic ecosystems. Dissolved O_2, dissolved CO_2, pH, conductivity, reactive and total phosphorus, and chlorophyll were measured at weekly intervals at three depths. Diel measurements of O_2, CO_2, and pH were made at monthly intervals. Oxygen concentrations were greatly reduced from initial conditions in both treated and control microcosms but eventually returned to higher concentrations in the treated microcosm; CO_2 was much higher and pH much lower in the control microcosm. Nutrients were rapidly mobilized to the water column after herbicide treatment but remained sequestered within water hyacinth in the untreated system. These results were compared with a study of

similar parameters in managed and unmanaged stands of water hyacintin a south Georgia pond. The comparisons indicate that microcosms are useful in assessing general effects of macrophyte growth and control, but there are limitations on extrapolating microcosm data to natural ecosystems.

26233 In situ continuous culturing of lake phytoplankton communities. deNoyelles, F. Jr.; Reinke, D.; Treanor, D.; Altenhofen, C. (Univ. of Kansas, Lawrence). pp 489-512 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

In situ continuous culturing of lake phytoplankton communities permits perturbation experiments to be conducted under natural conditions on a conveniently small scale. Enclosure effects are reduced by the continuous inflow of lake water; this permits the lengthy incubation times necessary for observation of changes in community structure in response to experimental perturbation. Comparison with laboratory continuous cultures receiving either raw or filtered lake water demonstrates the clear superiority of the in situ system for maintaining realistic community composition relative to the natural phytoplankton community. Responses of natural phytoplankton communities to nutrient enrichment and to cadmium addition are demonstrated, with the cadmium responses studied at the Experimental Lakes Area (northwest Ontario) compared with those from large-diameter in situ tube experiments. The relative merits of these and other types of microcosms are discussed.

26234 Responses of aquatic microcosms to acute mortality. Taub, F.B.; Crow, M.E.; Hartmann, H.J. (Univ. of Washington, Seattle). pp 513-535 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Responses of replicate synthetic microcosms to several patterns of mortality were observed. The microcosms consisted of protozoa, rotifers, Daphnia, amphipods, and 10 species of algae in a chemically defined medium with synthetic sediment. Early (day 4) nonselective mortalities of 60% of the total community resulted in transient reduction of most components and processes. Electron-transport-system enzyme activity, adenosine triphosphate (ATP) concentration, and ^{14}C uptake were among the best parameters to demonstrate the mortality. Killing 45% of the algae and other microplankton on day 7 temporarily reduced oxygen production, ^{14}C uptake, chlorophyll, and ATP. The Daphnia population crashed 2 weeks after the algal kill. Killing 45% of the Dapynia on day 14 temporarily reduced the early Daphnia population but did not prevent a Daphnia bloom. Killing 15% of the Daphnia weekly resulted in a consistently smaller Daphnia populations and a temporary increase in algal biomass. The microcosms reacted to the mortalities with compensatory responses and intertrophic effects, frequently with time lags. They were elastic and resilient to these acute mortalities and did not maintain permanent differences from the control.

26235 Succession in laboratory microecosystems subjected to thermal and nutrient-addition stresses. Kitchens, W.M.; Copeland, B.J. (North Carolina State Univ., Raleigh). pp 536-561 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

In an attempt to verify the ecosystem development model of Margalef and Odum, a study was conducted using a holistic approach to analyze the time response of successional patterns of replicate algal mat ecosystems. The 252 flask-type microecosystems were subjected to six different nutrient-addition treatments and incubated at either 20 or 30°C over seven sample periods within a 2:6:7 factorially designed experiment. The behavior of measured attributes with time corresponds very closely to the Margalef-Odum tabular model of ecosystem development (succession) across the spectra of treatments. Biomass increased with time during early successional stages, reaching an asymptotic or steady-state level by the mid-course of the experiment (with the exception of the control series at 20°C incubation temperature). Chlorophyll a behaved similarly. The ratio of carotenoids to chlorophyll a generally increased with time. Net photosynthesis and nighttime respiration reached a maximum by the middle of the study and varied erratically thereafter. By day 28 the photosynthesis-to-respiration ratio varied around unity for all treatments in the 20°C treatment series, but no observable trend was evident for the 30°C series. Ratios of biomass to net photosynthesis (B/P) generally increased with time for all treatments. Ratios of biomass to chlorophyll a varied similarly to the B/P ratio. It was noted that nutrient-addition treatments applied late in succession generally exhibited negligible effects on the successional trends of the microecosystems in the 30°C series. However, the nutrient addition served to initiate succession in the 20°C series.

26236 Use of microcosms to evaluate acid lake recovery techniques. DePinto, J.V.; Guminiak, R.F.; Howell, R.S.; Edzwald, J.K. (Clarkson Coll. of Tech., Potsdam, NY). pp 562-582 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Continuous-flow sediment-water microcosms have been demonstrated as effective simulations of the sediment-water interactions that take place relative to the recovery of acid lakes. The microcosm experimentation in this study indicated that the sediments of an acid lake must be considered, along with the water itself, in any chemical manipulation technique aimed at neutralizing the system. With regard to choosing a treatment material, this study demonstrated that it is desirable to add enough $CaCO_3$ to form a precipitate, which can act as a future source of alkalinity. A combined treatment of fly ash and $CaCO_3$ proved to be the most effective means of mitigating the acid inputs by establishing a system that was well buffered at a pH of 6.4.

26237 On-site flume studies for assessment of effluent impacts on stream aufwuchs communities. Hoffman, R.W. (Univ. of California, Davis); Horne, A.J. pp 610-624 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Temporary flumes and aufwuchs communities were evaluated for on-site perturbation assessment in the Truckee River, California. Comparing the Truckee River studies with other flume studies emphasized the differences between applied and basic research designs. Eighty-one percent of the attached algal species in the river were represented in the flumes without statistically significant ($P = 0.05$) difference. The artificial substrates used replicated 91% of the species found on natural substrates in the river. Variation between flume aufwuchs communities and riverine communities was of a magnitude similar to that among habitats in a river. The high variability characteristic of lotic ecosystems was reflected in between-flume coefficients of variation often exceeding 100%. This makes flume replication essential and adds realism to the flume methodology. The high variability also makes the power of statistical analysis of flume results similar to that of in situ river-station data. Clear trends evolved through the use of replicated treatments and multiple indicators. Measurement of multiple indicators (community photosynthesis and respiration, adenosine triphosphate, particulate organic carbon, dry weight, and fluorescence) proved necessary because of both high variability and nonuniform response of parameters to perturbations. Mobile flume arrays, replicated treatments, and multiple indicator determinations used at on-site locations appear to be a presently usable and widely applicable approach to environmental-effects assessment for lotic communities.

26238 Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms. Rodgers, J.H. Jr.; Clark, J.R.; Dickson, K.L.; Cairns, J. Jr. pp 625-644 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Six model streams were used to examine relationships between indexes of aufwuchs community structure (dry weight, ash-free dry weight, adenosine triphosphate, and chlorophyll a) and

function (net primary productivity and net microbial productivity) over a variety of environmental and physiological conditions. Individual streams were treated separately with potential enrichments, such as reduced carbon compounds, phosphorus, and nitrogen, and were perturbed with toxicants, such as copper, chromium, and chlorine, to elicit responses by aufwuchs communities that accumulated on artificial substrata. Measurements from treated streams were compared with those from untreated reference streams. Reductions in accumulated matter or biomass and chlorophyll a on artificial substrates were measured in toxicant-treated streams. Net primary productivity and assimilatory sulfate reduction were most sensitive to copper and dichromate, respectively. Significant increases in accumulated matter were measured in streams treated with sucrose but not in dextrose-treated streams. Phosphate and nitrogen additions did not elicit significant responses in streams. Net microbial productivity and net primary productivity of the attached community were estimated by assimilatory sulfate reduction and ^{14}C fixation, respectively; heterotrophic productivity was determined by difference. Addition of reduced carbon compounds and toxicants resulted in communities functionally dominated by heterotrophs. Measurements of functional parameters were significantly less variable than determinations of structure. Neither the perturbations nor the treatments reduced variability in the nontaxonomic structural and functional aspects measured. When stream aufwuchs communities were perturbed, indexes of structure often changed without a corresponding alteration of function.

26239 Limitations on the use of microcosms for predicting algal response to nutrient enrichment in lotic systems. Manuel, C.Y.; Minshall, G.W. (Idaho State Univ., Pocatello). pp 645-667 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Use of artificial stream experiments in predicting the response of natural lotic systems to increased nutrient levels is discussed and evaluated by comparing results from artificial stream studies with those from in situ experiments conducted in the Big Wood River, Idaho. In the artificial streams algae responded positively to the addition of either nitrogen or phosphorus. At concentrations of nitrogen above 0.5 mg/liter, however, the algal community could not use the additional nitrogen unless phosphorus was supplied. In contrast, in the in situ experiment, nitrogen plus phosphorus failed to produce significant increases in either chlorophyll a or algal biomass. The difference in results appears to be caused by the absence of sloughing and grazing in artificial streams at rates comparable to those found under natural conditions and suggests that these factors must be accounted for if the results of stream microcosm studies are to be applicable to natural systems.

26240 Marine microcosms in ecological research. Pilson, M.E.Q.; Nixon, S.W. (Univ. of Rhode Island, Kingston). pp 724-741 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

The use of microcosms in marine research is a recent development, beginning in earnest in the early 1960s. The level of effort during this time has ranged from that of single investigators with small flasks to complex multi-institutional programs using 1300-m^3 containers. A major recent trend is the use of microcosms as living models of specific natural ecosystems or types of systems, in contrast to earlier research that tended to use microcosms as small-scale environments in their own right in which certain properties and processes common to all ecosystems might be studies. Attempts were made to design experimental systems in which light, flushing, surface-to-volume ratios, and turbulence are scaled appropriately and to evaluate the consequences, if any, of the exclusion of larger animals. The influence of size on microcosm behavior is yet to be fully assessed. There appears to be little in the way of ecological theory that is very instructive in addressing any of these questions, and most workers either avoided a rigorous attempt to scale their systems or resorted to a time-consuming iterative empirical approach. The interpretation of scaling experiments, as well as other microcosm studies, is made more difficult by lack of any general operational definition of success in microcosm behavior. It is not clear how closely and with respect to which parameters a microcosm must follow the natural system to be considered an acceptable model. There is not even agreement that it is in principle possible for a microcosm to track the natural system very well. Also, it is not clear how the variance that seems to be inherent in the behavior of replicate microcosms should be viewed. Since nature is extremely variable, it can be argued that replicate microcosms cannot model nature well unless they also display considerable variation.

26241 Applying results derived from experimental microcosms to the study of natural pelagic marine ecosystems. Menzel, D.W. (Skidaway Inst. of Oceanography, Savannah, GA). pp 742-752 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

The microcosm approach is applied to the study of pelagic marine environments to eliminate the effects of horizontal drift of water and included organisms and to establish control and experimental plots against which population changes from known physical - chemical alterations in the environment can be measured. Because of the virtual impossibility of mimicking the natural pelagic environment realistically, the design of microcosms and the experimental purpose to which they are applied must be dictated by the specific questions posed. Appropriate questions are limited to those which address population interactions in a short-term temporal dimension only. Several hypotheses developed from the Controlled Ecosystem Pollution Experiment suggest that (1) assuming adequate vertical turbulence, the size of phytoplankton cells (which, in turn, controls the structure of zooplankton communities) is a direct function of ambient nutrient concentrations; (2) to assess changes in population structure caused by imposed stress, the investigator must make experiment length exceed the generation time of the organisms under study; and (3) changes in the physical - chemical environment, whether natural or unnatural, lead to a predictable sequence in the succession of plant populations. These hypotheses were tested in studies of the effects of deep-water Gulf Stream intrusions onto the southeast continental shelf (USA). All hypotheses were supported to some degree. It was found that nutrient-rich subsurface intrusions often cause blooms of diatoms which, because of their large size, may be unavailable to grazing zooplankton; since advected nutrients may be depeleted by plants within 2 weeks, zooplankton and benthos with life cycles of 20 or more days do not respond to the increased plant production; and as nutrients are depleted the plant populations revert to small-celled organisms typical of surface and surrounding waters.

26242 Annual nutrient cycles in a marine microcosm. Pilson, M.E.Q.; Oviatt, C.A.; Nixon, S.W. (Univ. of Rhode Island, Kingston). pp 753-778 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Concentrations of ammonia, nitrate plus nitrite, phosphate, and silicate measured in microcosms at weekly intervals during one full year of operation are compared with concurrent data from adjacent Narragansett Bay and with data from a year-long survey of the bay taken in 1972-1973. The major features of the annual cycles for each nutrient in the bay were reflected in observations from nine microcosm tanks. This indicates that the forces driving the cycles in the bay must have counterparts in the microcosms and that the general features of chemical cycling were similar. Some of the small differences in timing between the behavior in the microcosms and the bay provide insight into the causal factors operating in both bay and tanks. This is the first demonstration that such living models of a coastal marine ecosystem will maintain themselves in reasonably normal condition through a complete annual cycle. It appears that the presence of sediment and associated organisms have a crucial influence on the annual cycles of nutrients and probably other substances. Experimentation with the microcosms should help elucidate the processes operative in such systems.

26243 Response of a benthic marine microcosm subjected to changes in energy flow. Smith, T.P. (Univ. of Rhode Island, Kingston). pp 801-817 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Nine replicate benthic estuarine microcosms (0.09 m^2) were maintained in the laboratory under constant light intensity (10 langleys/day), photoperiod (12:12 h), and temperature (15°C). After 30 days three microcosms were subjected to a 50% higher rate of energy flow (light input was increased to 15 langleys/day, and temperature was increased to 22°C); three were subjected to a 50% lower rate of energy flow (light intensity was decreased to 5 langleys/day and temperature was decreased to 7°C); and the remaining three were maintained at the original temperature and light intensity. Previous independent measurements of community respiration as a function of temperature allowed respiration to be adjusted so that the ratio of input to output energy remained constant while different rates of energy flow were generated. After 40 days under these conditions, when all systems had reached a new metabolic steady state, a complete reciprocal transplant experiment was performed. One of the microcosms from each treatment was exposed to each of the other energy treatments to examine the effect of energy flow history on the stability of metabolism of a system subjected to perturbations in energy input and output. The results suggest that these complex systems responded in a nonlinear fashion, attaining a new metabolic steady state in 60 days. The ability to reattain metabolic stability was related to the amount of energy available and the rate of flow of that energy. Systems with a high energy flow rate achieved a new metabolic steady more quickly than systems with a lower energy flow rate. Systems with a high energy flow rate showed less variability over time in the production-to-respiration ratio than systems with a lower flow rate.

26244 Turbulent mixing in aquatic microcosms. Nixon, S.W.; Alonso, D.; Pilson, M.E.Q.; Buckley, B.A. (Univ. of Rhode Island, Kingston). pp 818-849 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

On the basis of theoretical considerations and a small body of available empirical evidence, the rate of dissipation of turbulent mixing energy appears to influence the behavior and physiology of plankton in marine and freshwater ecosystems. However, because of technical difficulties in measuring turbulence, there has generally been little effort to consider this feature in designing microcosms as analogues of natural systems. In the relatively large (13-m^3) microcosms at the Marine Ecosystems Research Laboratory at the University of Rhode Island, a mechanical mixing device was included in an attempt to provide a turbulence regime that is appropriate for plankton from Narragansett Bay, a shallow (9-m), well-mixed estuary. The characteristics of water mixing and turbulent energy dissipation in the microcosms are described and compared with the bay by use of a number of measures, including dye tracers, $CaSO_4$ dissolution rates, freshwater and saltwater mixing studies, air-sea gas-exchange properties, and neighbor diffusivity estimates obtained from paired floats. The rate of vertical water mixing appears to be considerably more rapid in the tanks than in Narragansett Bay, but the horizontal turbulent field appears to be less than that generally found in near-shore marine waters. In both the microcosms and the natural system, the amount of energy passing through the biological system appears to be greater than that dissipated by the physical system in turbulent water mixing.

26245 Conversion of dissolved manganese to particulate manganese during diatom bloom: effects of the manganese cycle in the MERL microcosms. Hunt, C.D.; Smith, D.L. (Univ. of Rhode Island, Kingston). pp 850-868 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Conversion of dissolved manganese to particulate manganese ocurred during a minor diatom bloom during August and September 1978 in the Marine Ecosystems Research Laboratory (MERL) microcosms. Correlations beteen chlorophyll a and particulate manganese suggest that 29 moles Mn were transferred to the particulate phase for every mole of chlorophyll formed during the active growth of the diatoms. The particulate manganese formed was primarily removed to the sediments after the blood terminated. Budgetary considerations indicate that the major input (90 to 95%) of manganese to the water column of the MERL tanks during the warm seasons is from benthic remobilization. Total manganese concentrations, oberved on a weekly basis, suggest that the tanks are in steady state with this benthic input. A rapid return flux of manganese to the sediments must occur to maintain this steady state. Removal of manganese from the water column during the growth of diatoms could account for no more than 7% of the average daily benthic flux during the August-to-September period. The exact mechanism(s) involved in balancing the benthic flux have not been fully isolated. However, the ability to sample large, controlled ecosystems repeatedly over short time scales provides a system in which the geochemical cycle of manganese (plus other elements) can be readily modeled.

26246 Semitropical marine microcosms: facility design and an elevated-nutrient-effects experiment. Henderson, R.S. (Naval Ocean Systems Center, Kailua, HA); Smith, S.V. pp 869-910 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

A flow-through seawater microcosm facility, the Naval Ocean Systems Center (NOSC) laboratory, situated at an open-coat oligotrophic-water site in Hawaii is described and compared with a facility of similar design, the Hawaii Institute of Marine Biology (HIMB) laboratory, in the higher nutrient environs of a nearby bay. Results of simultaneous experiments examining the effects of inorganic nitrogen and phosphorus enrichment on benthic communities at both facilities are presented. Unshaded 500-liter flow-through tanks colonized by naturally recruited benthic communities were used. At both sites, treatments consisted of nitrogen-only and phosphorus-only enrichments of 8 μg atoms/liter, and control tanks were maintained. After 2 months of nutrient enrichment, fouling-panel scrapings from all enriched tanks showed substantial increases in biomass and phytopigment content relative to controls. At NOSC, algal genera in control microcosms were dominated about equally by blue-green algae and diatoms, whereas blue-green and green algae dominated microcosms treated with phosphorus and nitrogen, respectively. In the HIMB control tank, diatoms, blue-green algae, and green algae were about equally abundant. Blue-green algae and a red alga shared dominance in the HIMB phosphate tank, and the ammonium tank contained a dense growth of Ulva sp., a green alga commonly associated with nutrient-polluted waters. Infaunal samples from NOSC enriched tanks contained substantially more species and numbers of individuals than did control tanks. Infauna in the HIMB enriched tanks were equally or less abundant than in the control tank, but populations were probably affected by accidental chemical poisoning during failure of the seawater supply system. Epifauna in these tanks apparently were not strongly affected by the no-flow event. At HIMB, epifaunal areal coverage was greater in the treated tanks than in the control.

26247 Microcosms, macrophytes, and hierarchies: environmental research in the Chesapeake Bay. Kemp, W.M. (Univ. of Maryland, Cambridge); Lewis, M.R.; Cunningham, J.J.; Stevenson, J.C.; Boynton, W.R. pp 911-936 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

A format for the design of large environmental studies is presented which focuses research on a hierarchy of different scales ranging from microcosms to field experiments. This design is illustrated using as an example a current study of submerged macrophytes in the Chesapeake Bay. It is suggested that three fundamental criteria (controllability, realism, and generality) should be considered in such research designs; controllability decreases with scale of study in the hierarchial scheme, and realism and generality increase with scale. Generality may be extended at each scale by building mathematically abstract models and by performing multi-

ple experiments. Results of studies of large (700 liter) laboratory microcosms are presented to demonstrate the utility of such experimental systems for examining effects of herbicide stress on estuarine macrophyte communities, where community, macrophyte, and phytoplankton photosynthesis (P), respiration (R), and photosynthesis-to-respiration ratios exhibited clear patterns of response to perturbations. For example, under high herbicide dosage, in which water concentrations averaged 1.2 ppM, community P was depressed by 87 to 100% compared with controls, whereas at a lower herbicide dosage (0.18 ppM) community P was decreased by 40 to 93%. These concentrations are somewhat higher than those reported for the bay waters. Efforts to partition total community P and R into autotrophic components suggested an inherent problem in measuring ecological rates of subsystems isolated from their environment; the sum of component metabolism measurements was consistently lower than the community value. Calculations of variance for these metabolic measurements indicated that coefficients of variation (CV) were higher for P and R of system components than for P and R of whole communities and that CV also increased for both community and component metabolism after subjection to herbicide stress.

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 24924, 24925, 26117, 26122, 26123, 26127, 26132, 26133, 26140, 26142, 26145, 26146, 26147, 26160, 26182, 26183, 26193, 26201, 26237, 26239, 26339, 26340, 26358, 26359, 26360, 26361, 26362, 26363, 26364, 26365, 26366, 26367, 26368, 26369, 26370, 26371, 26372, 26373, 26374, 26375, 26376, 26377, 26378, 26379, 26380, 26381, 26382, 26383, 26384, 26385, 26386, 26387, 26395

26248 (CONF-800365—, pp 68-74) **Acidification of freshwaters: a large scale titration.** Henriksen, A. (Norwegian Inst. for Water Research, Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Poorly buffered freshwaters in large areas of northern Europe and eastern North America that lie in areas receiving acidic precipitation with pH < 4.7 are vulnerable to acidification. Based on the hypothesis that acidification of freshwaters can be envisaged as a titration of a bicarbonate solution with strong mineral acids, water-chemistry data for 719 lakes in south Norway provide the basis for a predictor nomograph by which the pH-levels in lakes can be predicted given only the calcium concentration in the lake water and the pH of precipitation. This nomograph can be used to predict the effects of future changes in the acidity of precipitation on the acidity of sensitive aquatic ecosystems.

26249 (CONF-800365—, pp 212-213) **Some aspects of acidification in southern Ontario.** Dillon, P.J.; Jeffries, D.S.; Scheider, W.A.; Yan, N.D. (Ontario Ministry of the Environment, Rexdale). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The southern part of Ontario is receiving a substantial input of strong acid, with the load about 5 to 10 times greater than in remote areas. The majority of the lakes in this area have very low buffering capacities. The net output of cations is about 3 times greater than in a similar area receiving 5 to 10 times less strong acid, with about two-thirds of the net output of cations attributable to the action of strong acids. Chemical changes that have occurred in lakes in the study area include elevation of Ca, SO_4, Al, and Mn concentrations.

26250 (CONF-800365—, pp 214-215) **Aqueous speciation of aluminum in the Adirondack region of New York State, USA.** Driscoll, C.T. (Syracuse Univ., NY). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Measurements were made on aluminum concentrations of surface waters in New York State. The variability of aluminum speciation to aqueous concentrations could alter overall water quality and result in serious biological effects on aquatic organisms.

26251 (CONF-800365—, pp 218-219) **Aluminum mobilization in acid stream environments, Great Smoky Mountains National Park, USA.** Herrmann, R.; Baron, J. (U.S.D.I., National Park Service, Washington, DC). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The effects of the deposition of aluminum and acidic chemicals from outcrops in the Great Smoky Mountains National Park were studied. Statistics indicate the decreased numbers of brook trout found within the park.

26252 (CONF-800365—, pp 220-221) **Acid groundwater in southwestern Sweden.** Hultberg, H. (Swedish Water and Air Pollution Research Inst., Gothenburg); Wenblad, A. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A statistical regional analysis was carried out to determine the water quality of groundwater in Sweden. Data was obtained from measuring groundwater pH values and concentrations of various soil nutrients and minerals.

26253 (CONF-800365—, pp 222-223) **Aluminum, a buffer in acidic waters.** Johannessen, M. (Norwegian Inst. for Water Research, Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The buffering capacity of aluminum was measured in various natural and synthetic waters using several concentrations. It is believed that aluminum may be a component that is a natural buffer in streams and lakes exposed to acidic precipitation.

26254 (CONF-800365—, pp 224-225) **Streamwater chemistry before, during and after snowmelt.** Johannessen, M. (Norwegian Inst. for Water Research, Oslo); Skartveit, A.; Wright, R.F. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The three stages of snowmelt are: (1) the pressing out of soil water (piston flow); (2) a peak in concentrations of many ions due to the preferential release of ionic contaminants in snow in the first phases of snowmelt; and (3) a dilution stage because the remaining snow contains most of the water but little of the ions. The resulting baseflow after springmelt is often lower than winter baseflow indicating that the reservoir has been renewed and that the catchment needs time to recover. These three phases can occur rapidly one after the other, or they can be separated by long periods in time.

26255 (CONF-800365—, pp 226-227) **Evolution of acidity in surface waters of Laurentides Park (Quebec, Canada) over a period of 40 years.** Jones, H.G. (Inst. national de la recherche scientifique, Sainte-Foy, Quebec); Ouellet, M.; Brakke, D.F. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

An attempt was made to evaluate the pattern of hydrogen ion deposition in lakes of the Laurentides Park of Quebec. Concentrations of ions were measured in the surface waters of the lakes to determine pH values and correlate them with depth.

26256 (CONF-800365—, pp 230-231) **Sulfur distribution and flux in two forested watersheds in eastern Tennessee.** Kelly, J.M. (TVA/ORNL, Oak Ridge, TN). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Total atmospheric inputs at Camp Branch and Cross Creek are 25.8 and 34.1 kg/ha/yr, respectively. Sulfur loss via streamflow is estimated to be 7.8 kg/ha/yr at Camp Branch and 6.8 kg/ha/yr at Cross Creek. These values are approximately 30 and 19%, respectively, of total annual atmospheric inputs. Estimates of net retention indicate that sulfur is being added at the rate of 18.0 kg/ha/yr at Camp Branch and 19.7 kg/ha/yr at Cross Creek. In both cases, it appears that sulfur is still being accumulated in the study

system. The values presented provide an indication of the current sulfur status of the study systems as well as current input/output relationships. The values presented are based on two years of data and will certainly change as additional years are integrated into the means. However, these values do provide a first approximation of the relative response of two systems to different levels of atmospheric input.

26257 (CONF-800365—, pp 232-233) **Preliminary characterization of three lake basins sensitive to acid precipitation in Nova Scotia, Canada.** Kerekes, J.J. (Dalhousie Univ., Halifax, Nova Scotia). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A chemical composition analysis of three lakes in Kejimkujik Park, Nova Scotia was done to determine sensitivity to acidic precipitation. A statistical approach was used to determine the mean pH values and constituent concentrations on a monthly basis.

26258 (CONF-800365—, pp 234-235) **Regional surveys of the chemistry of small Norwegian lakes: a statistical analysis of the data from 1974 to 1978.** Mohn, E. (Norwegian Computing Center, Oslo); Joranger, E.; Kalvenes, S.; Sollie, B.; Wright, R. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Modelling of water chemistry through regional surveys of lakes in Norway was carried out using data accumulated over four years. The relationships between water chemistry and precipitations during that time may now be examined as a statistical model.

26259 (CONF-800365—, pp 236-237) **Chemical characteristics and buffer capacity of fifty alpine lakes (Italy, Pennine-Lepontine Alps).** Mosello, R. (C.N.R. Inst. Italiano di Idrobiologia, Pallanza, Italy). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This research deals with hydrology and water chemistry of alpine lakes based on samples collected during 1979 and 1980. Chemical compositions of precipitations and watersheds were determined.

26260 (CONF-800365—, pp 240-241) **Importance of natural H^+ production for acidity in soil and water.** Rosenqvist, I. Th. (Univ. of Oslo, Norway); Joergensen, P.; Rueslatten, H. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This paper discusses some of the relationships between ionic strengths of waters in given runoff patterns. Hydrogen ion concentrations in watersheds and soils is due to a delicate balance between dissolved ions in atmospheric precipitations and buffering capacities of soils and vegetation. Changes that affect these areas may cause overall imbalance to these geochemical processes.

26261 (CONF-800365—, pp 242-243) **Observed relationships between ionic composition of precipitation and runoff.** Skartveit, A. (Univ. of Bergen, Norway). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Comparisons were made of precipitation and runoff ionic compositions. Statistics show that increased amounts of weighted mean concentrations of sulfur oxide and chlorine ions were observed through long-term data. This may lead to changes in the acidification levels due to the effects of acid precipitation.

26262 (CONF-800365—, pp 244-245) **Evidence of acidification of rivers of Eastern Canada.** Thompson, M.E. (National Water Research Inst., Burlington, Ontario); Elder,F.C.; Davis, R.; Whitlow, S. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data have been accumulated over the past few years which now appear to show evidence of a breakdown in the water quality of eastern Canada. This breakdown appears to be due to acid precipitation, and the many effects of pollutant deposition into surface waters. Regional assessments of environmental sensitivity to this problem are discussed.

26263 (CONF-800365—, pp 246-247) **Acidification of Belgian moorland pools by acid sulfur-rich rainwater.** Vangenechten, J.H.D.; Vanderborght, O.L.J. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Measurements were made and data accumulated showing that acidification and deposition of sulfur-rich rainwater into Belgian bogs and lakes has lowered the pH values and increased sulfate concentrations. This is, more than likely, due to industrial processes in northern Europe.

26264 (CONF-800365—, pp 248-249) **Acid lakes and streams in the Galloway area, southwestern Scotland.** Wright, R.F. (Norwegian Inst. for Water Research, Oslo); Harriman, R.; Henriksen, A.; Morrison, B.; Caines, L.A. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This paper contains data on a regional analysis of the United Kingdom where deposition of acidic precipitations onto a sensitive geologic region has caused acidification effects on lakes and streams.

26265 (CONF-800365—, pp 250-251) **Input-output budgets of major ions at gauged catchments in Norway.** Wright, R.F.; Johannessen, M. (Norwegian Inst. for Water Research, Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The amount of ions through precipitations and runoff was calculated in an input-output budget model at various areas in Norway. These measurements contribute evidence that pH readings in given areas vary from year to year, depending on the amount of precipitation received, and its acidity.

26266 (CONF-800365—, pp 252-253) **Framework for the integrated lake-watershed acidification study.** Goldstein, R.A. (Electric Power Research Inst., Palo Alto, CA); Chen, C.W.; Gherini, S.A.; Dean, J.D. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data accumulation on acidification studies has led to testing and design of a model for watersheds. This model will serve to provide a framework for hypotheses behind acidification studies demonstrating acidic producing and consuming processes, and all calculations involved.

26267 (CONF-800365—, pp 254-255) **Analysis of lake acidification using annual budgets.** Galloway, J.N. (Univ. of Virginia, Charlottesville); Schofield, C.L.; Hendrey, G.R.; Altwicker, E.R.; Troutman, D.E. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Comparisons were made between three lakes using data budgets. Alkalinity and chemical composition of the lakes were explained in relation to atmospheric deposition, hydrology, and overall size of watershed.

26268 (CONF-800365—, pp 256-257) **Atmospheric inputs to three Adirondack lake watersheds.** Johannes, A.H.; Altwicker, E.R. (Rensselaer Polytechnic Inst., Troy, NY). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Comparisons are made between three watersheds in the Adirondacks of New York State. Data analysis shows that there are seasonal variations of acidic precipitation in all three, with the summer months being the period of greatest sulfur deposition. Other atmospheric input data is discussed.

26269 (CONF-800365—, pp 262-263) **Comparison of lead, manganese, and zinc transport in three Adirondack lake watersheds, New York.** Troutman, D.; Peters, N. (Geological Survey, Albany, NY). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Concentrated levels of lead, manganese, and zinc have been reported in watersheds of both North America and the Scandinavian countries. Transport of these materials is increased as mobility increases due to their deposition in lakes and rivers which receive acidic precipitations. The pH level of these waters is lower causing a high output of basin discharge containing chemicals.

26270 (CONF-800365—, pp 264-265) **Sources of acidity in three lakes acidified during snowmelt.** Galloway, J.N. (Univ. of Virginia, Charlottesville); Schofield, C.L.; Hendrey, G.R.; Peters, N.E.; Johannes, A.H. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Comparisons were made on the acidification of lakes during snowmelt periods. Deposition of acids held in the snowpack, or deposited directly on the watershed was measured, gaining pH values and lake composition data.

26271 (CONF-800365—, pp 268-269) **Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. I. Sediment dating and chemical stratigraphy.** Norton, S.A. (Univ. of Maine, Orono); Hess, C.T. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Sampling of lake sediments in Norway was done in order to attempt to reconstruct lake response to acidification and metal deposition from atmospheric precipitations. All samples were dated using radioisotopes and a chemical analysis of composition was carried out.

26272 (CONF-800365—, pp 270-271) **Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. II. Diatom stratigraphy and inferred pH.** Davis, R.B.; Berge, F. (Univ. of Maine, Orono). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data of diatom counts from surface sediments have been useful in reconstructing pH values during the history of a lake. The pH values show that the lakes being reconstructed were extremely sensitive to minor inputs of acid.

26273 (CONF-800365—, pp 272-273) **Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. III. Cladoceran community structure and stratigraphy.** Brakke, D.F. (Univ. of Maine, Orono). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data indicate that chydorid populations may have been related to the numbers of other life in lakes at that time, and that they may have also survived under a pH value preference. These factors may or may not prove directly related to acidification of lakes.

26274 (CONF-800365—, pp 274-275) **Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. IV. Synthesis, and comparison with New England.** Davis, R.B.; Norton, S.A.; Brakke, D.F.; Berge, F.; Hess, C.T. (Univ. of Maine, Orono). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Comparisons of samples from lakes in Norway and ponds in New England have led to the conclusion that diatom data were not as dependent on pH levels as originally thought. All study lakes were chosen to be very similar to each other, with the exception of pH values.

26275 (CONF-800365—, pp 276-277) **Hydrogen, sulphur and nitrogen budgets in soils and catchments.** Rippon, J.E.; Skeffington, R.A.; Wood, M.J.; Brown, K.A.; Brown, D.J.A. (Central Electricity Research Lab., Surrey, England). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Chemical pathways of the effects of acid rain on soils and surface waters were studied. Data on soil microbiology were analyzed after six months of testing and differences in acid watering and control results were obvious.

26276 (CONF-800365—, pp 278-279) **Effect of chemical weathering on surface waters.** Webb, A.H. (Central Electricity Research Labs., Surrey, England). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Increases in weathering occur due to precipitation or increases in acidity, as do increases in surface water pH levels. It appears to be a necessity to be able to calculate weathering levels in order to determine pH values from various lake survey data.

26277 (CONF-800365—, pp 286-287) **Sulfate at Birkenes, a small forested catchment in southernmost Norway.** Christophersen, N. (Central Inst. for Industrial Research, Oslo, Norway); Wright, R.F. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Using hydrologic data to construct a flow model, the movement and replacement of acid carbonates with sulfates is shown in this Norwegian study.

26278 (CONF-800365—, pp 288-289) **Modelling sulfate concentrations in streamwater at Storgama, Southern Norway.** Dymbe, L. (Univ. of Oslo, Norway); Christophersen, N. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data showing sulfate control in fresh waters are accumulated and used in a hydrologic flow model for southern Norway. An attempt is made to account for seasonal variations in sulfate concentration budgets.

26279 (CONF-800365—, pp 306-307) **Decomposition and exchange processes in acidified lake sediment.** Gahnstroem, G.; Andersson, G.; Fleischer, S. (Univ of Lund, Sweden). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This paper involves a study of chemical processes that lake sediments undergo as they are exposed to acidic conditions. Sampling of water and sediments was carried out showing comparisons of several lakes in southwestern Sweden.

26280 (CONF-800365—, pp 312-313) **Ecology of acid streams draining forested and non-forested catchments in Scotland.** Harriman, R.; Morrison, B. (Freshwater Fisheries Lab., Pitlochry, Scotland). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Sampling of streams was conducted in Scotland to try and determine what effect forested areas containing coniferous trees might have on the pH values of drainage basins. The regional geology and soil profiles are considered. Speculation is made on species diversity of all organisms throughout the watershed area.

26281 (CONF-800365—, pp 338-339) **Potential for acid precipitation damage to aquatic ecosystems of the Sierra Nevada, California (USA).** Tonnessen, K.; Harte, J. (Lawrence Berkeley Lab., CA). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Microcosm experiments were carried out to determine the effect of acidic precipitation on the Sierra Nevada range of California.

26282 (CONF-800365—, pp 340-341) **Effects of acidity on decomposition of organic matter in aquatic environments.** Traaen, T.S. (Norwegian Inst. for Water Research, Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Decomposition of organic matter appears retarded in acid waters. Reduced decomposition will lead to increased accumulation of organic matter and thereby reduced nutrient cycling. It is likely that waters where slowly degradable, coarse allochthonous material is an important energy source will be most affected.

26283 (CONF-800365—, pp 352-353) **Have changes in use of land influenced the regional lake acidification.** Timberlid, J.A. (Univ. of Bergen, Norway). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A survey was conducted to attempt to explain the use of land as a possible contributing effect on acidification of lakes in southern Norway. The survey also contains historical agricultural developments in Norway since the late 1800's to present day.

26284 (CONF-800365—, pp 358-366) **Acidification of freshwater: sources and mechanisms.** Seip, H.M. (Central Inst. for Industrial Research, Oslo, Norway). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The fraction of the precipitation reaching rivers and lakes essentially unchanged, is normally small. Thus the direct effects are small, but not negligible. Changes in the soil may occur as a result of acid precipitation. This may contribute to freshwater acidification. However, these effects are also likely to be small, but not negligible. Though there seems to be no consistent pattern of changes in land use that may explain regional acidification, these factors are probably contributing in some areas. The easiest way to understand the acidification of freshwater is by considering the increased sulfate deposition. The increased concentrations of mobile anions explain at least a substantial part of the observed acidification. There seems therefore to be no reason to doubt that the increase in the deposition acidifying components has played an important role in the acidification of freshwater.

26285 (CONF-800365—, pp 377-379) **Acidified lake districts of the world: a comparison of water chemistry of lakes in southern Norway, southern Sweden, southwestern Scotland, the Adirondack Mountains of New York, and southeastern Ontario.** Wright, R.F. (Norwegian Inst. for Water Research, Oslo); Conroy, N.; Dickson, W.T.; Harriman, R.; Henriksen, A.; Schofield, C.L. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Comparison data of water chemistry of lakes in different areas of the world were used to build empirical models. These models showed acidification effects in lakes and other fresh water bodies.

26286 (CONF-801217—, pp 249-271) **State-of-the-art in modeling solute and sediment transport in rivers.** Sayre, W.W. (Geological Survey, Denver, CO). 1980. NTIS, PC A17/MF A01.

From Symposium on modeling and low-level waste management; Denver, CO, USA (1 Dec 1980).

This overview is structured around a comprehensive general model based on the conservation of mass principle as applied to dissolved and particulate constituents in rivers, with a few restricted but more specific examples that illustrate the state-of-the-art in modeling typical physical, chemical, and biological processes undergone by selected constituents in rivers. These examples include: simplified one- and two-dimensional formulations focusing on the hydrodynamic advection and dispersion mechanisms; a two-dimensional biochemial oxygen demand-dissolved oxygen model; a one-dimensional polychlorinated biphenyl model that includes uptake and release of constituent by suspended sediment, and deposition and erosion of contaminated particles; and a one-dimensional sediment transport model that accounts for interactions between the flow and the bed, and is capable of tracking dispersing slugs of sediment through cycles of erosion, entrainment, transport in suspension and as bed load, and burial and storage in the bed.

26287 **(ORNL/TM—7564) WHC: a multi-dimensional model of water movement, heat flow, and chemical transport in complex aquifer systems.** Crooks, E.A.; Yeh, G.T. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 84p. (ESD—1671). NTIS, PC A05/MF A01. Order Number DE81025895.

This report presents the first stage in the development of a model for simulating the water movements, heat flows, and chemical transport and transformation in complex aquifer systems. The model employs the integrated compartment method for numerically solving the simultaneous equations governing the pressure head, temperature, and chemical distribution in saturated-unsaturated porous media. Whereas the model is intended for the application to one, two, and three-dimensional problems as desired, a preliminary application is made to a simple one-dimensional problem for debugging the computer code. This preliminary exercise indicates that the model is capable of simulating the expected flow and transport behaviors under non-isothermal conditions.

26288 **(PB—81-115677) Effect of fluctuating reservoir release on the downstream environment.** Kraft, K.J.; Mundahl, N.D. (Michigan State Univ., East Lansing (USA). Inst. of Water Research). Aug 1980. Contracts DI-14-34-001-9024;DI-14-34-001-0124. 25p. NTIS, PC A02/MF A01.

Temperature, depth, width, current velocity, turbidity, conductivity, and benthic macroinvertebrates were examined for one year above and below the Prickett Generating Station on the Sturgeon River. For most of the year this generating station operated during the day and shut down at night and on weekends. On days with on-off generator operation, downstream diurnal temperature ranges were similar to those upstream, but on days with continuous generation downstream temperatures for at least 10 km remained relatively constant. The maximum temperature upstream was 22C, 200 m downstream 24.5C, and 10 km downstream 23C. Current during generation more than doubled at 200 m downstream, but increased only slightly 10 km downstream. Depth during generation increased 75 cm at 200 m downstream and 40 cm 10 km downstream. Turbidity ranged from 7 to 12 ppm SiO2. Invertebrate density and biomass were lowest in May and highest in September and October.

26289 **(UCRL—85673) Two-dimensional modeling of the oceans and CO_2 uptake.** Viecelli, J.A.; Ellsaesser, H.W.; Burt, J.E. (Lawrence Livermore National Lab., CA (USA); Illinois Univ., Urbana (USA)). 15 Apr 1981. Contract W-7405-ENG-48. 22p. (CONF-810813—2). NTIS, PC A02/MF A01.

From National American Chemical Society summer meeting; New York, NY, USA (23 Aug 1981).

The possibility that additional carbon dioxide uptake by the oceans could be resulting from latitude or depth variations in eddy mixing combined with the slow convective overturning of the deep waters and that the short run thermocline uptake rate is much greater than one would estimate on the basis of long term deep water C14 concentrations is examined by means of a crude latitude dependent model. The model is used to examine the effects of latitudial variation in the thermocline eddy mixing rate and the effects of convective overturning on CO_2 uptake. (ACR)

26290 **Metal tracers in two marine microcosms: sensitivity to scale and configuration.** Alder, D.; Amdurer, M.; Santschi, P.H. (Columbia Univ., Palisades, NY). pp 348-368 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Microcosm experiments using radioactive tracers provide unique opportunities to study the movement of pollutants in aquatic

ecosystems. During the early spring of 1978, trace-metal behavior was studied in two microcosms of different size and configuration containing Narragansett Bay water and sediment - a 13,000-liter tank (Marine Ecosystems Research Laboratory) and a smaller 150-liter tank (Environmental Protection Agency Marine Water Quality Laboratory). Five gamma-emitting trace-metal isotopes (^{51}Cr, ^{59}Fe, ^{58}Co, /sup 115m/Cd, and ^{203}Hg) were added to the tanks, and their residence times in the water column were determined over a period of 2 months. The proportion of each added tracer found in the sediments, in conjunction with its water-column residence time, was used to calculate half-removal time to the sediments. The rates of removal and final sinks of each metal were very similar in the two microcosms although removal rates and reservoirs of the various metals differed substantially. The order of reactivities decreased as Fe $\geqq$ Hg $\cong$ Cr $>$ Co $>$ Cd (half-removal times ranged from 5 to 220 days). The more reactive metals (Fe, Hg, and Cr) were associated preferentially with suspended particles. Their major removal mechanism from the water column was uptake by particles, either within the water column or at the sediment - water interface. The slowly reacting metals (Co and Cd) were removed mainly by adsorption within the bioturbated layer of the sediments. The similarity of results in these very different microcosms indicates the potential utility of small microcosms for understanding the fate of toxic substances in the marine environment.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 25108, 25115, 25116, 25164, 25165, 25970, 25976, 26167, 26168, 26169

26291 (CONF-801063—6) Measurements of the oxidation state and concentration of plutonium in interstitial waters of the Irish Sea. Nelson, D.M.; Lovett, M.B. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 14p. NTIS, PC A02/MF A01. Order Number DE81023909.

From International symposium on the impacts of radionuclide releases into the marine environment; Vienna, Austria (6 Oct 1980).

The question of plutonium movement in interstitial waters resulting from diffusion along concentration gradients or from advective flow is addressed. The results of measurements of both the concentration and the oxidation state of plutonium in interstitial water collected from sediments near the Windscale discharge, in the solid phases of these sediments and in seawater and suspended solids collected at the coring locations are discussed. (ACR)

26292 Radionuclides in liquid effluents from Argonne National Laboratory: an example of monitoring for a multidisciplinary nuclear laboratory. Sedlet, J.; Golchert, N.W. (Argonne National Lab., IL). *American Society for Testing and Materials, Special Technical Publication ;* No. 698, 75-83(1980). (CONF-780719—).

From Conference of the American Society for Testing and Materials; Johnson, VT, USA (9 Jul 1978).

The environmental monitoring program conducted by Argonne National Laboratory for radionuclides in effluent and surface water is described and the results for the past six years are summarized. Small amounts of several radionuclides have been present in Argonne wastewater, and are consequently detectable in the stream that receives this water. The most abundant of these is hydrogen-3, whose average concentration in the stream during this period was about 3000 pCi/litre, equivalent to 0.1 percent of the drinking water standard. The distribution of plutonium and neptunium between stream water and particulate matter was studied. Plutonium tends to be relatively insoluble and become associated with the sediment, while most of the neptunium is in solution. This difference in behavior should be taken into account in designing environmental sampling and analytical programs and in dosimetric evaluation of effluent releases.

26293 Relative mobilization of zinc, cerium, and americium from sediment in an aquatic microcosm. Giesy, J.P.; Geiger, R.A. (Savannah River Ecology Lab., Aiken, SC). pp 304-318 of Microsms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

The effect of rooted aquatic macrophytes on the relative mobility of ^{65}Zn, ^{144}Ce, and ^{241}Am from sediment was investigated in sediment - water microcosms. The presence of macrophytes resulted in a greater total above-sediment biomass and reduced seston and aufwuchs biomass. Macrophytes also increased the total mass of all three elements in the above-sediment components. This increase was not caused solely by increased biomass into which the isotopes could partition since concentrations of all three isotopes were increased in the water, seston, and aufwuchs as a result of the presence of macrophytes. The ratio of ^{241}Am to ^{144}Ce was the same in seston, aufwuchs, and macrophytes when macrophytes were present. The presence of macrophytes caused a reduction of ^{241}Am relative to ^{144}Ce in the water, seston, and aufwuchs. The dynamics of ^{65}Zn were different from those of ^{144}Ce and ^{241}Am. The ratio of ^{241}Am to ^{65}Zn was approximately sevenfold greater in seston, aufwuchs, and macrophytes than in sediments or water, with macrophytes causing a significant increase in this ratio only in water. Even though the sediments contained a large quantity of stable zinc, the observed behavior of ^{65}Zn could not be attributed to isotopic dilution. Rather ^{65}Zn seems to be restricted from uptake by biota, relative to ^{241}Zm and ^{144}Ce. The microcosms studied here were sufficient to study the relative mobility of trace elements from sediments, as well as specific pathways of mobilization, but were not useful for measuring the rate and absolute magnitude of elemental fluxes from sediments, which could be extrapolated to larger systems.

5204 Thermal Effluents Monitoring And Transport

REFER ALSO TO CITATION(S) 26142, 26328, 26329, 26330

26294 (DP-MS—81-64) Effects of thermal additions on the presence of pathogenic and nonpathogenic free-living amoebae at the Savannah River Laboratory. Tyndall, R.L. (Tennessee Univ., Knoxville (USA)). 1980. Contract AC09-76SR00001. 78p. NTIS, PC A05/MF A01. Order Number DE81025594.

A study of the effect of thermal additions on the presence of free-living thermophilic amoeba at the Savannah River site was undertaken. Seasonality effects and the influence of varied degrees of thermal enrichment on the numbers and types of thermophilic pathogenic and nonpathogenic amoeba were determined. In addition, the ability of thermophilic nonpathogenic Naegleria to competitively inhibit the growth of the pathogenic Naegleria was defined and related to water quality differences.

26295 (PB—81-116857) Modeling of heated surface jets. Final technical report. Chang, R.; Liu, L.; Santanam, C.; Kennedy, L.A. (State Univ. of New York, Buffalo (USA). Dept. of Mechanical Engineering). Sep 1979. Contract DI-14-34-0001-5203. 198p. NTIS, PC A09/MF A01.

Laboratory studies of heated water jets were undertaken to model real-life discharges by thermal power plants. Thermal pollution can be controlled if there can be an accurate prediction of the water temperature and velocity distribution in the disposal area. A Laser-Doppler Velocimeter (LDV) system was developed to measure the velocity of the heated jets without the use of dyes or floating objects. The thermally stratified surface jets were analyzed at a particular Richardson Number and Reynolds Number. The turbulent entrainment of temperature stratified flows was also measured and the range of Reynolds numbers was quite narrow and the mixing coefficients were found to only be functions of the local Richardson Number. A numerical model was developed for predicting the behavior of a heated surface jet as it penetrates a quiescent body of water.

5205 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 24978, 26299

26296 (ANL/ES—109) Assessment of the impacts of water intakes on alewife, rainbow smelt, and yellow perch populations in Lake Michigan. Spigarelli, S.A.; Jensen, A.J.; Thommes, M.M. (Argonne National Lab., IL (USA)). Mar 1981. Contract W-31-109-ENG-38. 189p. NTIS, PC A09/MF A01. Order Number DE81025030.

A large volume of water is withdrawn from Lake Michigan for cooling and other industrial and municipal purposes. Potential ecological impacts of such withdrawals have caused concern. This study estimates the impacts of entrainment and impingement at water intakes on alewife, smelt, and yellow perch populations of Lake Michigan. Impingement and entrainment estimates were based on data collected by utilities for 316(b) demonstrations at 16 power plants. Two conventional fishery stock assessment models, the surplus production model and the dynamic pool model, were applied to assess the impacts. Fisheries data were applied to estimate the model parameters. Movements related to spawning and seasonal habitat selection cause high variation in impingement and entrainment over time and location. Impingement and entrainment rates were related to geographic location, intake type and position, and volume of water flow. Although the biomass impinged and numbers entrained are large, the proportions of the standing stocks impinged and the proportions of the eggs and larvae entrained are small. The reductions in biomass assuming full flow at all intakes and our estimates of biomass in 1975 are predicted by the models to be: 2.86% for alewife, 0.76% for smelt, and 0.28% for yellow perch.

26297 (ANL/LRP—10) Tongue River in Wyoming: a baseline fisheries assessment, Monarch to the state line. Wesche, T.A.; Johnson, L.S. (Argonne National Lab., IL (USA); Wyoming Univ., Laramie (USA). Water Resources Research Inst.). Apr 1981. Contract W-31-109-ENG-38. 167p. NTIS, PC A08/MF A01. Order Number DE81025033.

A baseline study of fish populations was conducted in northeastern Wyoming's Tongue River and Goose Creek as part of a research project on the ecological effects of a large surface coal mine near Sheridan, Wyoming. The study area is a transition zone between the cold-water, torrential habitat in the Bighorn Mountains and the warm-water, quiet-zone habitat of the lower Tongue River. Fauna of the study area form one of the most diverse fisheries in Wyoming and include brown and rainbow trout, sauger, smallmouth bass, and black bullhead. Diversity generally increases in a downstream direction. Sauger and northern pike are extending their ranges from Montana into Wyoming to spawn; sauger in the study area are very fast-growing, probably due to the abundance of forage species. Studies should continue on the effect of the new Tongue River channel at the Big Horn Mine site in order to determine if recolonization is occurring. Spawning movements of sauger and northern pike in the Tongue River should be followed so that the effects of future mining along the Tongue River may be evaluated.

26298 (PB—81-118333) Report to the Congress on ocean pollution and offshore development, October 1977 through September 1978. Annual report No. 6. (National Oceanic and Atmospheric Administration, Washington, DC (USA)). May 1980. 94p. NTIS, PC A05/MF A01.

This sixth annual report on NOAA's research activities in progress during Fiscal Year 1978 presents the highlights that contributed to a better understanding of the marine environment and the effect of human activities upon it. Four principal areas of concern were addressed: petroleum hydrocarbons, chlorinated (man-made) hydrocarbons, metals, and biological hazards.

5206 Regulations

REFER ALSO TO CITATION(S) 26147

26299 Significant issues in water resources policy. Parker, F.L. (Vanderbilt Univ., Nashville, TN). *Environment International ;* **3**: No. 3, 205-211(1980).

The difficulties in resolving water resource policy questions are analogous in many ways to the difficulties in resolving energy policy questions - technical, legal, institutional and social. Federal involvement in water resources began in 1809 and continues to the present time. The most recent comprehensive study was the Second National Water Assessment by the US Water Resources Council in 1979. Conclusions reached were that water quality and quantity and surface and ground water are artificial distinctions, that water policies should reflect national needs and priorities, that flood control must be accelerated and drinking water quality protected and that more decisions should be made at a local level while integrated into national planning and development. Though the study disaggregated the US into 106 subregions, its projections of a single future rather than a range of futures gives an erroneous sense of predictability to the work. To help resolve the major problems, inadequate supply and contamination and flooding and erosion, ultrasophisticated mathematical models are widely utilized without sufficient verification. A more tractable approach for policy studies would be to use simplified semi-empirical models rather than first principle models. Possibly more important, policyresolution awaits social value resolution which means that the policies adopted must be flexible, incremental, and non-divisive.

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

REFER ALSO TO CITATION(S) 25879

5301 Social And Economic Studies

REFER ALSO TO CITATION(S) 25832, 25833

26300 (ANL/CNSV-TM—60, pp 37-51) **International conference on prepared fuels and resource recovery.** Ballard, C.A. (Dillon, Read and Co., Inc., New York, NY). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

The financing of municipal resource recovery and waste processing facilities by general obligation bonds, special revenue bonds, industrial development revenue bonds, and private sector financing are discussed in this paper. The principal risks involved in the financing of these types of projects are reviewed. How these risks were addressed in 4 different US cities, each having different problems and objectives, are considered. (DMC)

26301 (ANL/CNSV-TM—60, pp 455-468) **Waste flow control and its role in financing resource recovery facilities.** Dinolfo, G.A. (Salomon Brothers, New York, NY). Apr 1981. NTIS, PC A23/MF A01.

From International conference on prepared fuels and resource recovery technology; Nashville, TN, USA (10 Feb 1981).

Waste flow control and its application to the financing of resource recovery projects has been perceived as a creation of the investment banking community. The concept of waste flow control may have been advanced by this industry but only as a vehicle to foster the development of these high technology resource recovery projects in the United States. Because of the complex nature of these projects, their relatively high capital cost, the general public attitude toward limiting traditional municipal borrowing and the inherent finite debt capacity of the private companies active in the field, financing options have been developed which call for projects to be self supporting having only limited municipal or private sector guarantees. This presentation outlines the magnitude of the capital requirements for the industry, the present financial condition of municipal governments and further reviews the need for waste flow control as part of the four essentials for a sound resource recovery project as each applies to the financing on a self supporting basis. Actual financings accomplished to date are reviewed and other techniques in accomplishing waste flow control are discussed.

26302 (DOE/MI/01002—T5(App.B)) Minority Network Directory: appendix B. (Solar America, Inc., Albuquerque, NM). [nd]. Contract AC01-80MI01002. 47p. NTIS, PC A03/MF A01. Order Number DE81025196.

The Minority Network Directory lists major organizations, both national and local, which are currently involved in assisting and/or promoting minority businesses. The Directory includes the names, addresses, and telephone numbers of key organizations involved in minority business development in the following order: (1) Small Business Administration (SBA); (2) Minority Business Redevelopment Agency (MBDA); (3) Minority Business Development Organizations (MBDO); (4) National Economic Development Association (NEDA); (5) National Minority Purchasing Councils (NMPC); (6) other minority business development organizations; and (7) other minority organizations.

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 24971

26303 **(DOE/ERD—0031) Environmental readiness document: industrial programs, FY 1980.** (USDOE Assistant Secretary for Environment, Washington, DC. Office of Environmental Assessments). Feb 1981. 174p. NTIS, PC A08/MF A01. Order Number DE81026037.

Nine technologies under development are discussed. They are: heat pump grain dryer, blended cement, acetylene from coal,polypropylene waste to fuel oil, foam-dying textiles, microwave/vacuum drying, fuel-saving paint plant, new fertilizer process, and high-performance forge furnace. Each is discussed from the standpoint of the technology, environmental concerns, and regulatory and control considerations. The environmental readiness of each is summarized. (JGB)

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5502 Biochemistry

REFER ALSO TO CITATION(S) 25288, 26312, 26398

26304 **Characterization of mucin isolated from rat tracheal transplants.** Clark, J.N.; Marchok, A.C. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Biochimica et Biophysica Acta ;* **588**: 357-367(1979).

Subcutaneous rat tracheal grafts yield several milligrams of secretions from which a homogeneous mucin fraction was isolated and purified. Histological evidence demonstrated that a normal mucociliary epithelium and mucous secretion were maintained for the 4 to 6 weeks of the experiment. The collected secretions were initially characterized by column chromatography on Sepharose CL-6B which separated the excluded high molecular weight mucins (unpurified mucin fraction) from most of the serum-type glycoproteins and proteins, including albumin. A reductive alkylation treatment of the unpurified mucin fraction followed by Sepharose CL-4B chromatography removed contaminating protein and most of the mannose-containing material from the mucin fraction. The void volume material from this column produced a single high molecular weight band upon sodium dodecyl sulfate agarose/acrylamide gel electrophoresis. The purified mucin fraction contained 16.5% protein and primarily galactose, N-acetylglucosamine, N-acetylgalactosamine, and sialic acid. This fraction also underwent β-elimination in the presence of alkaline borohydride, demonstrating the presence of O-glycosidic linkages.

5503 Cytology

REFER ALSO TO CITATION(S) 26312

26305 **Human T-cell lymphoma with suppressor effects on the mixed lymphocyte reaction (MLR). I. Morphological and cytogenetic analysis.** Gaeke, M.E.; Vardiman, J.W.; Miller, W.; Medenica, M.; Hopper, J.E.; Rowley, J.D. (Univ. of Chicago, IL). Contract AC02-80-EV10360. *Blood ;* **57**: No. 4, 634-641(Apr 1981).

The aggressive clinical course and the distinctive histologic, cytochemical, and cytogenetic features of an adult non-Sezary T-cell lymphoma with suppressor activity have been investigated. Morphological and ultrastructural analysis of neoplastic cells from peripheral blood and involved lymph nodes revealed cells with convoluted nuclei, prominent cytoplasmic azurophilic granules, well developed Golgi apparatus, short strands of endoplasmic reticulum, and moderate numbers of ribosomes and mitochondria. Cytochemical reactions showed acid phosphates (ACP) positivity in virtually all of the neoplastic cells; in a substantial percentage of the cells, the tartrate-resistant acid phosphatase (T-ACP) isoenzyme was observed. The histologic and cytochemical features of these neoplastic suppressor cells were compared with those recently described for the suppressor T-cell fraction isolated from normal peripheral blood T-cell by Fcγ-rosette formation. The aneuploid clone had 47 chromosomes with multiple complex abnormalities. The extensive analysis of the histologic, cytochemical, and cytogenetic features of this adult T-cell suppressor lymphoma should help to clarify the criteria for distinguishing among the subsets of T-cell neoplasms with definable immunologic function.

26306 **Investigations into agents for improving cell labeling with positron and gamma emitting radionuclides.** Zoghbi, S.S.; Thakur, M.L.; Gottschalk, A. (Yale Univ., New Haven, CT (USA). School of Medicine); Pande, S.; Srivastava, S.C.; Richards, P. (Brookhaven National Lab., Upton, NY (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals ;* **18**: No. 1-2, 280-282(Jan-Feb 1981).

From 3. international symposium on radiopharmaceutical chemistry; St. Louis, MO, USA (16 - 20 Jun 1980).

5504 Genetics

REFER ALSO TO CITATION(S) 26312

5505 Metabolism

REFER ALSO TO CITATION(S) 26008

26307 **(CONF-800963—7) Model systems in photosynthesis research.** Katz, J.J.; Hindman, J.C. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01. Order Number DE81023889.

From 5. international photosynthesis congress; Kassandra-Halkidiki, Greece (7 Sep 1980).

After a general discussion of model studies in photosynthesis research, three recently developed model systems are described. The current status of covalently linked chlorophyll pairs as models for P700 and P865 is first briefly reviewed. Mg-tris(pyrochlorophyllide)1,1,1-tris(hydroxymethyl) ethane triester in its folded configuration is then discussed as a rudimentary antenna-photoreaction center model. Finally, self-assembled chlorophyll systems that contain a mixture of monomeric, oligomeric and special pair chlorophyll are shown to have fluorescence emission characteristics that resemble those of intact Tribonema aequale at room temperature in that both show fluorescence emission at 675 and 695 nm. In the self-assembled systems the wavelength of the emitted fluorescence depends on the wavelength of excitation, arguing that energy transfer between different chlorophyll species in these systems may be more complex than previously suspected.

26308 **(DOE/ER/03326—101) Photochemistry and enzymology of photosynthesis. Progress report, November 1, 1978-May 31, 1981.** Radmer, R.; Golbeck, J.; Velthuys, B. (Martin Marietta Labs., Baltimore, MD (USA)). May 1981. Contract AC02-76ER03326. 16p. NTIS, PC A02/MF A01. Order Number DE81025547.

Three different aspects of photosynthesis are being investigated. Three different technical approaches are being used (i.e., mass spectrometry; biochemical techniques; and a combination of polarographic, spectroscopic, and fluorescence techniques). In the first group of experiments, a specially designed mass spectrometer system was used to monitor the gas exchange in chloroplasts in response to single short flashes of light. Several gases and their isotopes (e.g., N_2, $^{15}N_2$, $^{18}O_2$, etc.) were monitored to study photosystem II reactions in chloroplasts, particularly those reactions that use donors other than H_2 ^{16}O (and evolve products other than $^{16}O_2$).

Our goal was to obtain a better understanding of the O_2-evolving system. The second topic studied was the role of copper in photosynthesis. Biochemical techniques were applied to investigating the role of nonplastocyanin copper in photosystem II- and photosystem I-mediated O_2 uptake via polyphenol oxidase. The third area of study was light harvesting and electron transport in C_4 plants. Many aspects of carbon flow in C_4 plants seem to be well understood; however, the distribution of photons and the flow of electrons in the two tissues of the leaves of C_4 plants remain enigmatic. We used polarographic, spectroscopic, and fluorescence techniques to gain an understanding of these processes.

5506 Medicine

REFER ALSO TO CITATION(S) 26005, 26085, 26305

26309 In vivo quantitation of regional myocardial blood flow by positron-emission computed tomography. Wisenberg, G.; Schelbert, H.R.; Hoffman, E.J.; Phelps, M.E.; Robinson, G.D. Jr.; Selin, C.E.; Child, J.; Skorton, D.; Kuhl, D.E. (Univ. of California, Los Angeles). Contract AM06-76-SF000012. *Circulation ;* **63**: No. 6, 1248-1258(Jun 1981).

The potential of positron-emission computed tomography (PCT) for external quantitation of myocardial indicator concentrations and regonal myocardial blood flow (RMBF) and the effect of left ventricular wall thickness on tracer concentration recovery by PCT was examined in seven open-chest dogs. RMBF was determined by the arterial reference technique in vivo and in vitro. Together with gamma-emitting Ce-141 microspheres, positron-emitting Ga-68-labeled microspheres were injected into the left atrium and their myocardial concentrations determined in vivo from gated and ungated cross-sectional PCT images. It is concluded that (1) myocardial indicator tissue concentrations, and thus, RMBF, can be accurately measured by PCT provided corrections are made for the effect of wall thickness on count recovery; (2) these corrections can be made using in vivo echocardiography; and (3) gated PCT imaging can be used to evaluate regional myocardial systolic wall thickening as an index of regional function and combined with measurements of RMBF or regional metabolism. The results represent a framework for the noninvasive measurement of RMBF and metabolism by PCT in the experimental animal and in man.

26310 N-13 ammonia as an indicator of myocardial blood flow. Schelbert, H.R.; Phelps, M.E.; Huang, S.C.; MacDonald, N.S.; Hansen, H.; Selin, C.; Kuhl, D.E. (Univ. of California, Los Angeles). Contract AM03-76-SF00012. *Circulation ;* **63**: No. 6, 1259-1272(Jun 1981).

We have characterized N-13 ammonia as a myocardial blood flow imaging agent suitable for positron-emission computed tomography. However, the mechanisms of uptake and retention of this agent in myocardium are not known, and effects of altered metabolism were not considered. Therefore, we studied the uptake and retention of N-13 ammonia in myocardium under various hemodynamic and metabolic conditions in open-chest dogs. N-13 ammonia was extracted nearly 100% during its initial capillary transit, followed by metabolic trapping that competed with flow-dependent back diffusion. At control flows, the first capillary transit extraction fraction (E) of N-13 ammonia averaged 0.82 +- 0.06. Inhibition of glutamine synthetase with L-methionine sulfoximine impaired metabolic trapping of N-13 ammonia and implicates te glutamic acid-glutamine reaction as the primary mechanism for ammonia fixation. Blood flow and metabolic trapping are the primary determinants of myocardial uptake and retention of N-13 ammonia. The relative constancy of metabolic trapping over a wide range of hemodynamic and metabolic conditions demonstrates the value of N-13 ammonia as a myocardial blood flow imaging agent.

26311 Myocardial uptake of sup(123m)Te-labeled long-chain fatty acids. Effects of heteroatom position and total chain length. Knapp, F.F.; Butler, T.A.; Ambrose, K.R.; Callahan, A.P.; Ferren, L.A.; Roberts, J.A.; Grigsby, R.A.; Irgolic, K.J. (Oak Ridge National Lab., TN (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals ;* **18**: No. 1-2, 175-176(Jan-Feb 1981).

From 3. international symposium on radiopharmaceutical chemistry; St. Louis, MO, USA (16 - 20 Jun 1980).

26312 Cytogenetic evidence for recurrence of acute myelogenous leukemia after allogeneic bone marrow transplantation in donor hematopoietic cells. Elfenbein, G.J.; Brogaonkar, D.S.; Bias, W.B. Contract EY-76-C-02-0069. *Blood ;* **52**: No. 3, 627-636(Sep 1978).

A 22-yr-old man with acute myelocytic leukemia received a bone marrow transplant from a genotypically HLA-identical female sibling after cyclophosphamide preparation. He remained in complete remission for 18 mo, when he developed a chloroma in the perineum. The chloroma was treated with local radiotherapy. The chloroma recurred 8 mo later and was treated with radiotherapy followed by combination chemotherapy. At 34 mo after transplant, marrow relapse and chloroma were documented. The first chloroma contained host cells by fluorescent Y-chromatin body analyses of interphase nuclei. All metaphase cells and karyotypes from peripheral blood and marrow samples showed no evidence of host cells from 3 wk after transplant through the time of marrow relapse. Data from autosomal and sex chromosome studies indicate that the marrow relapse occurred in cells of donor origin. A new consistent chromosome abnormality [45, X, -X, t(8;21) (q22; q22)] was observed in a majority of donor cells. The patient received a second bone marrow transplant from the same donor after preparation with busulfan and cyclophosphamide and attained a complete remission with full hematologic engraftment.

5507 Microbiology

REFER ALSO TO CITATION(S) 24993, 25179, 25288, 26321

26313 Effects of moisture content on long-term survival and regrowth of bacteria in wastewater sludge. Yeager, J.G. (BDM Corp., Albuquerque, NM); Ward, R.L. *Applied and Environmental Microbiology ;* **41**: No. 5, 1117-1122(May 1981).

The effects of moisture content on the survival and regrowth of seeded and indigenous enteric bacteria in raw sludge were determined. Cultures of six strains of fecally associated bacteria grown in sterilized, liquid sludge (5% solids) were all quite stable at this moisture level for over 90 days at 21°C. When the moisture content of the sludge containing these organisms was reduced by evaporation and the samples were stored at 21°C for extended periods, bacterial inactivation rates were generally proportional to the moisture losses of the samples. A dramatic reversal in this effect was observed in samples containing more than 90% solids. In this dried sludge, every bacterial species studied except Proteus mirabilis was found to be extremely stable. Bacteria indigenous to sludge were also found to survive for long periods in dried sludge. Growth of seeded Salmonella typhimurium was also found to occur in the presence of indigenous organisms in both liquid and dewatered raw sludges. However, the population density attained was well below that found in sterilized samples of the same sludges.

5509 Pathology

REFER ALSO TO CITATION(S) 26305

5510 Physiological Systems

REFER ALSO TO CITATION(S) 26304, 26305

5520 Public Health

REFER ALSO TO CITATION(S) 26118, 26319, 26320, 26393, 26732

26314 Epidemiology, public health, and health surveillance around point sources of pollution. Stebbings, J.H. Jr. (Los Alamos Scientific Lab., NM). *Environmental Research ;* **25**: No. 1, 1-7(Jun 1981).

In industrial society a large number of point sources of pollution exist, such as chemical plants, smelters, and nuclear power plants. Public concern has forced the practising epidemiologist to undertake health surveillance of the usually small populations living

around point sources. Although not justifiable as research, such epidemiologic surveillance activities are becoming a routine part of public health practice, and this trend will continue. This introduction reviews concepts of epidemiologic surveillance, and institutional problems relating to the quality of such applied research.

5530 Agriculture And Food Technology

REFER ALSO TO CITATION(S) 25289, 25798

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 25533, 25533, 26195, 26196, 26314, 26391

26315 **(DOE/EV/02283—2) Response of a forest ecotone to ionizing radiation. Progress report, October 15, 1980-October 14, 1981.** Murphy, P.G.; Sharitz, R.R. (Michigan State Univ., East Lansing (USA); Savannah River Ecology Lab., Aiken, SC (USA)). Jun 1981. Contract AS02-76EV02283. 25p. NTIS, PC A02/MF A01. Order Number DE81025053.

The primary objectives of this study are to determine the effects of ionizing radiation on the tree species composition of the ecotone between two forest types in northern Wisconsin and to compare the postirradiation recovery of the tree flora in the ecotone with that in the bordering forest types. Relatively distinct ecotones constitute a spatially significant portion of many second-growth forest ecosystems. Belt transects concentric to the radiation source (^{137}Cs) are being used to measure compositional changes in the ecotone from aspen to maple-birch forest types. Information available includes population densities by size class, importance values, and diversity values. Estimates of leaf area index and leaf litter production, by species, have also been obtained. Succession in the radiation areas is presently under study. To date, redevelopment of forest vegetation at up to 20 m from the radiation source has been slowed significantly by the vigorous colonization of heliophytes. Sampling for 1980-81 is on schedule. In all three areas competition from successional ground vegetation has continued to delay re-establishment of tree seedlings under the opened canopy at 10 m. In this regard, only the aspen area has shown any signs of recovering, having experienced an influx of red maple seedlings in 1978. Even that area, however, is still less than half preirradiation levels with respect to seedling densities. As unusually high ratio of shrub leaf litter to tree leaf litter in the 10 to 20 m area reflects the displacement of canopy species by successional shrubs. As the overall impact of the radiation stress depends on the rate of forest re-establishment, observations will continue for several more years.

26316 **(DOE/EV/10503—1) Biological effects of ionizing radiation at the molecular, cellular, and organismal levels. Progress report, October 15, 1978-October 14, 1981.** Lange, C.S. (State Univ. of New York Downstate Medical Center, Brooklyn (USA). Dept. of Radiation Oncology). Jun 1981. Contract AC02-80EV10503. 15p. NTIS, PC A02/MF A01. Order Number DE81024380.

Two major accomplishments have been achieved in the past three years with the support of this contract. Firstly, the original Zimm theory of rotor speed dependent DNA sedimentation has been tested quantitatively and found to be correct, i.e., T4c and T4D+ DNAs sedimented with S^0_{20} /sub w/ values as predicted by the equation of Zimm and Schumaker. Furthermore, the quantitative validity of the theory means that the size (M/sub r/) of a DNA sedimenting under speed-dependent conditions is not undefinable but rather can be uniquely obtained by the application of that theory to the data. Secondly, the viscoelastic recoil (Γ_{11}), or more accurately, the zero shear rate reduced recoil (Γ_{11} /sub r,O/) has been shown to be a quantitative direct function of the number of intact (T4c) DNA molecules present (per ml) in solution. This demonstration made possible the measurement of a direct survival curve for intact DNA molecules (i.e., without double-strand breaks) after exposure to ionizing radiation. A/sub DNA/D_{37} of 47.4 krads was obtained for the DNA of T4c coliphage irradiated in air as a solution of phage particles. It is noteworthy that this survival curve measures the number of intact DNA molecules, not the average number of breaks/molecule.

26317 **(DP-MS—81-1) Design guides for cell atmosphere controls, utilities and fire protection.** Hill, A.J. Jr.; Peishel, F.L.; Slattery, E.F. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.; Oak Ridge National Lab., TN (USA); Facilities Systems Engineering Corp., El Segundo, CA (USA)). 1981. Contract AC09-76SR00001. 13p. (CONF-810606—39). NTIS, PC A02/MF A01. Order Number DE81023043.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Facilities for handling radioactive and toxic materials must be designed not only for efficient operation, but also for protection of the operating personnel and the public. The ventilation system is of primary importance in maintaining containment of any airborne radioactivity. The type, number, and location of in-cell services must be adequate for planned operations, but also must allow flexibility to accommodate expansion in the scope of operations or changes in programs. Fire protection systems and operational controls are mandatory to maintain containment of radioactivity in the event of an operating error or process accident that may result in a fire.

26318 **Irreversible denaturation mapping of a pyrimidine-rich domain of a complex satellite DNA.** LaMarca, M.E.; Allison, D.P.; Skinner, D.M. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Journal of Biological Chemistry ;* **256**: No. 12, 6475-6479(25 Jun 1981).

The highly complex G + C-rich satellite DNA of the Bermuda land crab Gecarcinus lateralis has been studied by denaturation mapping. Following digestion of the satellite with EndoR.EcoRI, the major 2.07-kilo-base pair (kbp) basic repeating unit and a minor 4.14-kbp fragment were exposed to 254 nm light in the presence of silver ions, conditions which resulted in essentially irreversible denaturation of regions rich in adjacent pyrimidines by the formation of pyrimidine dimers. The positions and sizes of the denatured regions were determined in electron micrographs of partially denatured 2.07-kbp and 4.14-kbp fragments spread in the presence of formamide. The positions of the denaturation bubbles in the 4.14-kbp fragments support restriction enzyme mapping evidence that it is a dimer of the 2.07-kbp fragment arranged head to tail. Sequencing data show that the predominant sequence of a 0.29-kbp region centered aroung 0.64 kbp in the basic repeat unit is 49% A + T and that 42% of the bases are adjacent TTs and CTs capable of dimerization under the conditions used.

26319 **History of health studies around nuclear facilities: a methodologival consideration.** Tokuhata, G.K.; Smith, M.W. (Pennsylvania Dept. of Health, Harrisburg). *Environmental Research ;* **25**: No. 1, 75-85(Jun 1981).

A brief historical review was made of low-level radiation studies for general populations living around nuclear facilities. In addition, technical and methodological problems were identified and discussed which often arise in all epidemiological studies designed to determine the possible health effects of low-level radiation released from nuclear facilities. Need for extremely large populations for prospective cancer studies was discussed, but accompanying ascertainment difficulties were also emphasized. More epidemiological studies are needed to provide adequate assessment of the potential health hazards of nuclear facilities.

26320 **Morbidity and mortality in Los Alamos County, New Mexico. I. Methodological issues and preliminary results.** Stebbings, J.H. Jr.; Voelz, G.L. (Los Alamos Scientific Lab., NM). *Environmental Research ;* **25**: No. 1, 86-105(Jun 1981).

Cancer among Los Alamos County, New Mexico, male residents, all of whom have worked in or have lived within a few kilometers of a major plutonium plant and other nuclear facilities, has been reviewed with respect to mortality between 1950 and 1969 and incidence between 1969 and 1974. Several potentially causal occupational exposures have existed. Higher than expected incidence, currently, of cancers of the colon and rectum appears to be

explained better by socioeconomic than occupational factors. Healthy worker and healthy military effects, white ethnicity, and migration are discussed as intervening variables relevant to interpreting mortality data in counties dominated by a single major facility. The utility of county data bases in the study of single local area mortality rates is reviewed.

26321 **Response of bacteria in wastewater sludge to moisture loss by evaporation and effect of moisture content on bacterial inactivation by ionizing radiation.** Ward, R.L. (Sandia National Labs. Albuquerque, NM); Yeager, J.G.; Ashley, C.S. *Applied and Environmental Microbiology ;* **41**: No. 5, 1123-1127(May 1981).

Two studies were carried out to determine the influence of moisture content on the survival of bacteria in raw wastewater sludge. The first study involved the effect of water loss by evaporation on the bacterial population. The second used these dewatered samples to measure the effects of moisture content on the inactivation of bacteria in sludge by ionizing radiation. Both studies involved survival measurements of six representative fecally associated bacteria grown separately in sterilized sludge as well as survival data on bacteria indigenous to sludge. Growth of bacteria was stimulated in sludge during the initial phase of moisture removal by evaporation, but the reduction of moisture content below about 50% by weight caused a proportional decrease in bacterial numbers. The rates of inactivation of bacteria by ionizing radiation in sludge were usually modified to some degree by variations in moisture content. Most bacteria were found to be somewhat protected from ionizing radiation at reduced moisture levels.

26322 **Radiological protection program for a tritium luminous dial painting plant.** Chou, K.D.; Chen, W.L.; Tsai, C.M. (Inst. of Nuclear Energy Research, Lungtan, Taiwan). *Ho Tzu K'o Hsueh ;* **17**: No. 1, 33-37(Mar 1980).

From 2. Asian regional conference on radiation protection; Manila, Philippines (5 Nov 1979).

In recent years tritiated luminous compound and some other luminous paints containing radioactive substances have been used in the luminizing industry in Taiwan. In order to reduce internal exposure to workers and eliminate serious environmental contamination, a radiation protective surveillance program was set up in a typical tritium luminous dial painting plant in Taichung for radiation protection purposes. Both environment control and biological monitoring on workers were performed for more than six months. Liquid scintillation counting technique was used as the main method for measuring tritium in various samples. The concentration in air and water at working area was measured. The surface contamination was monitored and detected by using an AEP 5227 contamination meter. A large number of smears were taken by using glycerol coated filter paper which was then immersed into a glass vial to measure the tritium by liquid scintillation counter. Adequate ventilation appears to be the most important protective method as it can be used to reduce the internal exposure hazard; however, good clean working conditions are also necessary. Each worker monitored was asked to provide a pot sample of 24-h urine for bioassay monthly. The result of this protection program is presented and it shows that the internal exposure received by all workers is reduced significantly. Before the protection programthe average tritium concentration in workers' urine sample was 4.83 $\mu Cil^{-1}d^{-1}$. It decreased apparently under the protection program. Six months later this concentration reduced to 0.90 $\mu Cil^{-1}d^{-1}$.

5602 Thermal Effects

REFER ALSO TO CITATION(S) 25462

26323 **(EPRI-EA—1840) Literature review: response of fish to thermal discharges. Final report.** Talmage, S.S.; Opresko, D.M. (Oak Ridge National Lab., TN (USA)). May 1981. Contract W-7405-ENG-26. 101p. (ORNL/EIS—193). NTIS, PC A06/MF A01.

Information on the response of fish species to thermal discharges is reviewed in this report. The review is based on the literature contained in the Cooling Systems Effects Data Base. The compiled data reveal that fish species generally respond to thermal effluents according to their natural thermal preferences. These preferences differ from species to species and they vary seasonally, as do discharge water temperatures; consequently there are often temporal and spatial changes in the local fish fauna in the immediate area of a thermal discharge. Species normally adapted to cold water may be absent from a particular thermally-influenced area throughout most or all of the year. Conversely, some thermophilic species become year-round residents of discharge canals. Species with intermediate thermal tolerances may be absent from discharge areas during maximum summertime temperatures but they are often very abundant in the same areas at other times of the year. For many species, field temperature preferences are slightly above laboratory derived values, but field avoidance thresholds are substantially below lethal levels. Although individuals of many species are occasionally found in thermal effluents at lethal temperatures, populations as a whole avoid such effluents.

26324 **(EPRI-EA—1874) Ecological investigations at power plant cooling lakes, reservoirs, and ponds: an annotated bibliography. Final report.** Yost, F.E.; Talmage, S.S. (Atomic Industrial Forum, Inc., Washington, DC (USA); Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 168p. NTIS, PC A08/MF A01.

Presented as an annotated bibliography are 541 references dealing with ecological investigations at power plants which use cooling lakes, ponds, or reservoirs. The references were obtained from open literature and from environmental reports and impact statements prepared for or by the electric utility industry. The literature covers the period 1950 through mid-1980. Topics covered include site-specific studies at facilities using cooling lakes, ponds, or reservoirs, as well as special studies, engineering studies, and general studies. References are arranged alphabetically by author and indexes are provided to personal and corporate authors, facility names, regions, and taxonomic names.

26325 **(PB—81-114746) Phytoplankton studies and nutrient concentrations in the vicinity of the C. P. Crane Generating Station. Final report Jul 79 to Mar 80.** Sellner, K.G.; Lyons, L.A.; Mahoney, R.K.; Olson, M.M.; Perry, E.S. (Academy of Natural Sciences of Philadelphia, PA (USA). Div. of Limnology and Ecology). 17 Sep 1980. 75p. NTIS, PC A04/MF A01.

Plant operations at the C.P. Crane Generating Station, Baltimore County, Maryland, appeared to stimulate phytoplankton productivity at plant discharge and in upper Saltpeter Creek, from July 1979 through March 1980. Carbon fixation rates and assimulation ratios were enhanced in whole-water and nanoplankton size fractions for the three upper Saltpeter Creek stations compared to data collected at intake (Seneca Creek). However, few significant alterations in phytoplankton biomass (chlorophyll alpha) resulting plant operations were noted in the vicinity of the C.P. Crane plant. Enhanced productivities were probably a function of ambient water temperatures, Delta Ts observed between intake and the impacted areas and species composition of the phytoplankton. Increases in ammonium and nitrate, possibly plant-induced, were observed during four months. Since no direct indications of plant impact in the lower Gunpowder River were determined, data suggest that effects were limited to the immediate area of the canal discharge.

26326 **(PB—81-115610) Thermal stress studies on selected zooplankton species and an isopod.** Bunting, D.L.; Cheper, N.J. (Tennessee Univ., Knoxville (USA). Water Resources Research Center). Jun 1980. Contract DI-14-34-0001-0145. 61p. NTIS, PC A04/MF A01.

Laboratory determination of temperature stress levels and assessment of their ecological consequences was carried out for selected zooplankton species to develop data for ecological impact associated with industrial use of natural water for cooling. An included literature search revealed substantial fish and benthos data, but little on stress temperature effects on zooplankton. Information was gathered on two cladocerans, four copepods and an isopod.

26327 **(PB—81-119273) Pilot attempt to grow winter flounders commercially. Completion report 15 Feb 77-30 Jun 80.** Sawyer, P.J.; Hoornbeek, F.K. (New Hampshire Fish and Game Dept., Concord (USA)). Sep 1980. 71p. NTIS, PC A04/MF A01.

The first part of this report contains the details and results of laboratory efforts to raise flounders through the early developmental stages including metamorphosis. The second part reports the efforts to grow out newly metamorphosed flounders to commercial size. In order to produce marketable sized winter flounders in heated water, it will be necessary to assure availability of brood stock and an abundance of live food both prior and subsequent to metamorphosis.

26328 **Effects of temperature on periphyton biomass and community composition in the Browns Ferry experimental channels.** Armitage, B.J. (Tennessee Valley Authority, Decatur, AL). pp 668-683 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Periphyton biomass and community composition were estimated from March to September 1977 in the Browns Ferry experiental channels (112 by 4.3 by 1.2 m). Four temperature regimens (ambient Tennessee River water and elevations of 2, 4, and 6°C above ambient), with three channels per regimen, were maintained. A description of the research facility is included. The two most evident temperature effects were earlier dominance of certain algae in the warmest treatment and earlier export and greater total export of floating mats in the two warmest treatments. Total algal export from April through August was 5380, 4280, 7160, and 13,720 kg/ha in the ambient, +2, +4, and +6°C treatments, respectively. This exported biomass was composed almost exclusively of filamentous green algae, such as Oedogonium, Cladophora, and/or Spirogyra.

26329 **Effects of elevated temperatures on macroinvertebrate populations in the Browns Ferry experimental ecosystems.** Rodgers, E.B. (Tennessee Valley Authority, Decatur, AL). pp 684-702 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Effects of elevated temperatures on the density and biomass of macroinvertebrate populations in the upper (44 m) sections of 12 flowing-water outdoor channels (114 m in total length and stocked with bluegill and walleye) were determined from April to August 1977. Four temperature treatments, with three channels per treatment, were maintained - ambient (Tennessee River) and elevations of 2, 4 and 6°C above ambient. Ambient temperatures ranged from 10 to 30°C and exceeded 28°C for 78 of the total 128 days. Numerically predominant macroinvertebrates were Physa heterostropha, Hyalella azteca, Crangonyx sp., Caenis sp., and Chironomidae. Physa heterostropha were not consistently affected by any treatment. Amphipoda responded inversely to temperature increase in terms of both maximal biomass and duration of population existence. Caenis sp. and Chironomidae showed accelerated life cycles and suffered declines in the warmer channels. Total dry-weight biomass of macroinvertebrates was highest in +4 and +6°C channels in May (5 and 3 g/m^2, respectively) and highest in ambient channels in August (1.8 g/m^2). Although biomass in ambient channels was signficantly greater than in +4 and +6°C channels ($P \leq 0.05$), this increase was not reflected in total yield of adult and young-of-the-year bluegill at the termination of the study.

26330 **Effects of temperature on bluegill reproduction and young-of-the-year standing stocks in experimental ecosystems.** Wrenn, W.B.; Grannemann, K.L. (Tennessee Valley Authority, Decatur, AL). pp 703-714 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Reproduction of age I bluegill (L[pomis macrochirus) and resulting standing stocks of young of the year were investigated from March to September 1977 in 12 temperature-controlled outdoor channels, 112 by 4.3 by 1.2 m. Four temperature regimens, with three replicate channels per regimen, were maintained: ambient Tennessee River temperature and nominal elevations of 2, 4, and 6°C above ambient. Ambient temperatures exceeded 28°C for 78 days, and temperatures in the highest regimen exceeded 33°C for 80 days. The only consistent temperature effects were early inception of spawning and corresponding larger numbers of nests in the warm channels. No relationship was apparent between temperature and number of eggs per spawn, time between spawns per female, hatching success, or biomass of young of the year recovered. Dates and temperatures of initial spawning were: May 24, ambient (24.1°C); May 9, ambient +2 (23.2°C); May 5, ambient +4 (24.7°C); and April 28, ambient +6 (23°C). Spawning continued throughout the summer, ceasing during the last week of August in all temperature regimens. Mean total numbers of spawns for 30 females in the respective temperature treatments were 68, 71, 97, and 100. Mean number of larvae per nest was 5939. Mean standing-stock biomass of young of the year recovered in September ranged from 216 kg/ha in the +4°C regimen to 270 kg/ha in the ambient-temperature channels.

5603 Chemicals Metabolism And Toxicity

REFER ALSO TO CITATION(S) 26118, 26122, 26127, 26133, 26146, 26149, 26199, 26201, 26227, 26250, 26251, 26275, 26279, 26280, 26281, 26282, 26290, 26294, 26314

26331 **(BNL—29433) Effects of simulated acidic rainfalls on yields of field-grown radishes and garden beets.** Evans, L.S.; Cunningham, E.A.; Lewin, K.F. (Brookhaven National Lab., Upton, NY (USA); Manhattan Coll., New York (USA). Lab. for Plant Morphogenesis). 1981. Contract AC02-76CH00016. 7p. (CONF-810813—4). NTIS, PC A02/MF A01.

From National American Chemical Society summer meeting; New York, NY, USA (23 Aug 1981).

The effects of small additions of simulated acidic rain on radishes and garden beets grown under standard agronomic practices was determined. Only the foliage of plants was sprayed with simulated rain. The composition of the simulated rainfall approximated that of rain falling in the Long Island, NY area. (ACR)

26332 **(CONF-800365—) Ecological impact of acid precipitation.** Drabloes, D.; Tollan, A. (eds.). (SNSF-prosjektet, As-NLH (Nowray)). Oct 1980. 385p. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Separate abstracts were prepared for 134 of the papers presented in these proceedings. Investigations into: transport and deposition, vegetation and soils, water quality, aquatic biota, impacts on soils and indirect effects on vegetation, effects on water quality, effects on aquatic biota, and various integrated studies are all discussed. Six papers were previously input to the data base.

26333 (CONF-800365—, pp 33-40) **Collection and retention of atmospheric pollutants by vegetation.** Miller, H.D.; Miller, J.D. (Macaulay Inst. for Soil Research, Aberdeen, Scotland). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Elements are transferred from the atmosphere to plants in rain and in airborne salts and gases trapped upon surfaces. Measurements from various sites around Scotland are used to show that elements collected by the filtering effect are largely sea-derived, although some sulphur comes from other sources, and that much of the introduction is in mist, fog and small raindrops. On passing over a leaf surface, water gains ions both from the washdown of trapped salts and from crown leaching, the cations in the latter being derived in part from hydrogen ion exchange and in part as the accompanying ions for sulphate and chloride, considerable leaching of which is shown to occur. Foliar uptake is also demonstrated, with uptake of ammonium being an important factor controlling pH of throughfall. The efficient collection and retention of atmospheric nutrients is an important ecological mechanism, permitting trees to thrive on poor soils and enabling eventual succession with more nutrient demanding species. A concequence, however, is that forests will be peculiarly sensitive to atmospheric pollution.

26334 (CONF-800365—, pp 41-46) **Influence of rainfall composition on the yield and quality of agricultural crops.** Jacobson, J.S. (Cornell Univ., Ithaca, NY). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Research on effects on agricultural crops of rainfall composition, especially the elevated concentrations of hydrogen, sulfate, and nitrate ions associated with acidic precipitation, has intensified during the past several years. Preliminary results suggest that direct contact of rain with plant foliage can affect the growth, development, yield, and quality of agricultural crops. However, many factors determine the magnitude and direction of these effects. Acidity of rain is but one of these factors and the information available is sufficient only to suggest hypotheses for testing rather than to draw firm conclusions. Two opposing forces determine the net effect occurring when acidic precipitation contacts vegetative tissues. The effects of acidity may have detrimental consequences for crops through disruption of hydrogen ion balance within cells, through enhanced loss of important nutrients, or by other means. However, rain and its components may be excluded from foliar or reproductive tissues; acidity can be neutralized on leaf surfaces; and physiological processes tend to resist changes in hydrogen ion concentrations. Furthermore, the accumulation of nitrate and/or sulfate can, under some circumstances, benefit plant growth and yield. Improvements in procedures for duplicating ambient rainfall and growth conditions during experimentation with crop plants are needed to provide a more substantial basis for predicting the consequences of acidic precipitation for agricultural productivity.

26335 (CONF-800365—, pp 47-52) **Effects of acid precipitation on biochemical activities in soil.** Alexander, M. (Cornell Univ., Ithaca, NY). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The available experimental data on acidification of soils suggests severe consequences as the decomposition of soil organic matter by microorganisms is affected. This result could lead to alteration of available nutrients used in the biochemical processes of forest plants. (DLS)

26336 (CONF-800365—, pp 53-57) **Acid precipitation and soil buffering capacity.** Voigt, G.K. (Yale Univ., New Haven, CT). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Acid precipitation appears to experience modification to varying degrees as it passes through the soil profile. In the forest floor precipitation may be neutralized by basic cations from organic matter or by ion uptake by non-woody roots. Soil fauna centered in or near the forest floor may be adversely affected by acid precipitation. Pedogenic weathering reactions release constituent ions from soil minerals in the substratum. Many of these ions are capable of neutralizing acid precipitation, but the extent to which neutralization occurs depends on the degree of mixing between soil water in equilibrium with primary mineral surfaces and soil water from a given storm moving through the profile. Because of its prevalence in common soil minerals and its relatively high degree of chemical activity, aluminum assumes a dominant role in regulating soil solution composition and acidity. High levels of active aluminum in the soil solution may influence soil inhabiting organism by increasing acidity or by toxicity. These adverse effects appear less likely in soils originating from geologic materials characterized by minerals high in alkali metals and alkaline earth elements.

26337 (CONF-800365—, pp 58-63) **Acid precipitation, plant nutrients and forest growth.** Abrahamsen, G. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Apart from possible direct effects of acid precipitation on forest trees, the effects on forest growth can be considered as a nutrition problem. The increased deposition of N and S can be regarded as an eutrophication or fertilization effect, and the increased leaching of nutrient cations caused by the increased leaching of SO_4^{2-} can be regarded as an oligotrophication or acidification effect. Experience from forest fertilization is therefore useful when evaluating the effects of acid precipitation on forest growth. The fertilizer experiments in temperate forest have shown that N, K, P, Mg, and S individually or in combinations might restrict growth of forest trees. The requirement of forest trees for micronutrients is incompletely known, but deficiencies of these nutrients also occur. These factors alone indicate that a generalization of a common effect of acid precipitation for most forest is impossible. In addition, the influence of acid precipitation on the loss of plant nutrients by leaching is highly dependent on soil properties.

26338 (CONF-800365—, pp 64-67) **Effect of acid precipitation on tree growth.** Strand, L. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Tree ring data from sample trees of Norway spruce and Scots pine from 6150 sample plots were analyzed to see if there are growth responses that could be attributed to acid precipitation. No such response could be definitely established, with the technique used.

26339 (CONF-800365—, pp 84-92) **Acidification: effects on freshwater fish.** Muniz, I.P. (Univ. of Oslo, Norway); Leivestad, H. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The acidification and losses of natural resources constitutes a major environmental problem in vast areas of Scandinavia and in North America. Effects are documented on different trophic levels in the aquatic ecosystems. Severe losses of fish populations are among the most prominent effects of acidification and have created great public concern. If the present trend of population losses continues, 80% of the brown trout populations in the affected areas in the four southernmost counties will be lost within 1990. The losses started in small dilute headwater lakes and have over the years gradually spread downstream towards the coast to include larger lakes with higher salt content. The population responses are often very complex depending on the life cycle of the species, and different strategies for survival may be exploited in a response to a changing environment. Field laboratory experiments have shown that the most common mechanism of population extinction is post-embryonic mortality and subsequent lack of recruitment. Fish death in acid water is most probably due to failure in body salt regulation and normal gill function. These processes are also affected by toxic substances leached into the water from land, and recent studies have confirmed that aqueous aluminum ligands are the most potent compounds in upsetting the salt balance. Aqueous aluminum may also lead to severe ecosystem effects and exemplifies the complex interaction between the edaphic and the aquatic systems during the acidification process.

26340 (CONF-800365—, pp 93-98) **Widespread and diverse changes in the biota of North American lakes and rivers coincident with acidification.** Harvey, H.H. (Univ. of Toronto, Ontario). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The precipitation falling over part of eastern North America is as acidic as that in southern Norway and Sweden. This acid rain and snow induces acid pulses in streams and rivers. The acidification of lakes and rivers in recent decades has been documented for several areas in the United States and Canada. The best documented biological consequence of acidification is the loss of all fish populations; this has occurred in some 200 lakes in the Adirondacks and 200 lakes in Ontario. The mechanism of extinction most often is failure of recruitment of new age-classes into the population. At intermediate levels of acid stress there are changes in fish abundance, in species composition, and in rates of growth. Recognition of these effects in North America has lagged seriously the Scandinavian perception.

26341 (CONF-800365—, pp 146) **Influence of a polluted atmosphere on cuticle degradation in Scots pine (Pinus sylvestris).** Fowler, D.; Cape, J.N.; Nicholson, I.A.; Kinnaird, J.W.; Paterson, I.S. (Inst. of Terrestrial Ecology, Midlothian, Scotland). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A comparison study was performed in the United Kingdom on the effect of air pollutants on pines. One region of high air pollutant concentrations was evaluated against another region of low concentrations. The observations on cuticle decomposition were recorded in the region of high air pollutant concentration.

26342 (CONF-800365—, pp 154-155) **Deposition of nitrogen oxides to Scots pine (Pinus sylvestris L.).** Bengtson, C. (Swedish Water and Air Pollution Inst., Goeteborg, Sweden); Bostroem, C.A.; Grennfelt, P.; Skarby, L.; Troeng, E. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This research focused on an attempt to estimate uptake of nitrogen oxides by Scots pine and to see if deposition of various concentrations of nitrogen oxides affects photosynthesis or transpiration.

26343 (CONF-800365—, pp 158-159) **Impact of acid precipitation on forest canopies and soils in the northeastern US.** Cronan, C.S.; Reiners, W.A.; Reynolds, R.C. Jr. (Dartmouth College, Hanover, NH). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data from research programs on the White Mountains of New Hampshire have shown contrasting biogeochemical characteristics of acid precipitation on the two types of forest zones and soils. Percolation and leaching was also examined during this study.

26344 (CONF-800365—, pp 164-165) **Reconstruction of species composition of stands as a necessary condition for the survival of the Niepolomice Forest.** Fabijanowski, J.; Lesinski, J.A. (Inst. of Silviculture, Cracow, Poland). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Pollution effects on the historic Niepolomice Forest of Poland has led to a study on the species composition of the forest. The effects are proven as causing problems with losses of specific species of trees.

26345 (CONF-800365—, pp 168-169) **Air pollutants as additional stress factors of conifers under northern conditions.** Huttunen, S.; Laine, K.; Pakonen, T. (Univ. of Oulu, Finland). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The data presented show that air pollution induced stress in conifers develops as concentration of pollutants increases. Since pine needles vary in the amount of atmospheric moisture taken in at different times of the year, seasonal variations in stress have been established.

26346 (CONF-800365—, pp 170-171) **Response of field-grown soybeans to acid precipitation alone and in combination with sulfur dioxide.** Irving, P.M.; Miller, J.E. (Argonne National Lab., IL). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Acid precipitation effects on soybeans were tested along with sulfur dioxide effects. No visible damage occurred to the plants being tested, however there was an indication of biological stress induced by acid rain. This resulted in lower productivity and effects of sulfur dioxide resulted in decreased plant productivity along with physiological damage.

26347 (CONF-800365—, pp 172-173) **Effect of artificial acid rain on the spectral reflectance and photosynthesis of Scots pine seedlings.** Jaakkola, S. (Lab. of Land Use, Espoo, Finland); Katainen, H.S.; Kellomaki, S.; Saukkola, P. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data from this study attempted to provide a correlation between photosynthetic activity and spectral reflectance in pine seedlings. Air impurities on plant cover had a direct effect on reflectivity of light, and on this assumption, may give laboratory studies some idea that reflectivity will occur to some degree in field studies.

26348 (CONF-800365—, pp 178-179) **Effects of experimental acidification on soil organism populations and decomposition.** Lohm, U. (Swedish Univ. of Agricultural Sciences, Uppsala). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Observations on a terrestrial ecosystem to test the effects of acid precipitation on soil organisms were made in a Swedish study. Data were collected over a period of time in an attempt to examine nutrient recycling in forests with possible consequences of long-term effects.

26349 (CONF-800365—, pp 188-189) **Effects of artificial acidification with sulfuric acid on tree growth in Scots pine forest.** Tamm, C.O.; Wiklander, G. (Swedish Univ. of Agricultural Sciences, Uppsala). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Experimental data was accumulated to show the effects of sulfuric acid on the plant growth of a pine forest in Sweden. This does not necessarily show that acid precipitation would have the same effects, but it does conclusively show that a constituent of acid precipitation has been experimentally proven to inhibit tree growth.

26350 (CONF-800365—, pp 190-191) **Effects of acid precipitation on soil and forest. 1. Methods of the field experiments.** Abrahamsen, G. (Norwegian Forest Research Inst., Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The effects of acid precipitation on forests and soils was recorded experimentally using lysimeters. Plots of tree stands were subjected to various concentrations and moistures.

26351 (CONF-800365—, pp 192-193) **Effects of acid precipitation on soil and forest. 2. Atmosphere-vegetation interactions.** Horntvedt, R. (Norwegian Forest Research Inst., Oslo); Dollard, G.J.; Joranger, E. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Field experiments were used to obtain data on the acidification of soils by irrigation, and by measuring samples of natural precipitation above and below tree crowns. Chemical interactions and deposition of sulfur dioxide were also tested.

26352 (CONF-800365—, pp 196) **Effects of acid precipitation on soil and forest. 4. Leaching of plant nutrients.** Abrahamsen, G. (Norwegian Forest Research Inst., Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Lysimeters were used to study the effects of acid artificial rain on soils. As increased sulfur concentrations occur due to precipitation, the concentrations also are retained in the soil and pH value changed noticably. Leaching, in general, increases as sulfur concentrations increased, taking away plant nutrients within the soil.

26353 (CONF-800365—, pp 200-201) **Effects of acid precipitation on soil and forest. 6. Lysimeter experiment in greenhouse.** Bjor, K.; Teigen, O. (Norwegian Forest Research Inst., Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Treatment effects of artificial acid rain on soils and plants were measured using lysimeters in greenhouses. Soil profiles were

compared with average pH values and plant uptake of nutrients was studied.

26354 (CONF-800365—, pp 202-203) **Effects of acid precipitation on soil and forest. 7. Soil animals.** Hagvar, S. (Norwegian Forest Research Inst., Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Reactions of some soil dwelling animals were observed under experimental conditions in Norway. Comparisons were made between the effects of lime and acidification on these animals. It was hypothesized that there was a correlation between animal reproduction and pH levels within the soils.

26355 (CONF-800365—, pp 204-205) **Effects of acid precipitation on soil and forest. 8. Foliar nutrient concentrations in field experiments.** Tveite, B. (Norwegian Forest Research Inst., Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This paper reports of the foliar samples taken in field experimentation on the effects of simulated acid precipitation. The dry weights of pine and spruce needles show a percentage of nutrients retained.

26356 (CONF-800365—, pp 206-207) **Effects of acid precipitation on soil and forest. 9. Tree growth in field experiments.** Tveite, B. (Norwegian Forest Research Inst., Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The design of this experiment is to comparatively show that some trees show less of the effects of artificial acid rain than others. The trees are measured as height or diameter plant growth against pH induced growth.

26357 (CONF-800365—, pp 208-209) **Effects of acid precipitation on soil and forest. 10. The effect of growth of Norway spruce on soil acidity by acid irrigation.** Ogner, G. (Norwegian Forest Research Inst., Oslo). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The acidity of water within soils and the soil itself may be influenced by plant growth due to increased nutrients supplied by acid precipitation. Increases in growth by the spruce also show an increase in soil acidity.

26358 (CONF-800365—, pp 228-229) **Acidification impacts on lakes in the Sudbury, Ontario, Canada area.** Keller, W. (Ontario Ministry of the Environment, Sudbury); Gunn, J.; Conroy, N. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Emissions from the smelting industry in the Sudbury region of Canada are the world's largest point pollution source for sulfur dioxide. Regional impacts from this pollution have proven devastating. Data was accumulated to study the effects on aquatic ecosystems being contaminated in this region.

26359 (CONF-800365—, pp 280-281) **Fish and freshwater chemistry.** Brown, D.J.A.; Sadler, K.; Howells, G.D.; Kallend, A.S. (Central Electricity Research Labs., Surrey, England). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Calcium levels are known to be important for determining survival of a fish at low pH levels. High concentrations of hydrogen and sulfates are coincident, and high concentrations of calcium are known to be coincident with high sulfate levels. These concentrations are detrimental to fish survival, and status for improvements in fish populations due to a change in pH level would be small.

26360 (CONF-800365—, pp 282-283) **Physiology of fish in acid waters.** McWilliams, P.G. (Univ. of Lancaster, England); Brown, D.J.A.; Howells, G.D.; Potts, W.T.W. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Conditions of high concentrations of hydrogen ions and calcium are known to have physiological effects on trout which means that they must maintain their body salts at greater concentrations. Although in some areas these conditions occur naturally, they most often occur due to acidic streams, rivers and lakes subjected to acidic precipitations.

26361 (CONF-800365—, pp 292-293) **Aluminum toxicity to fish as related to acid precipitation and Adirondack surface water quality.** Baker, J.P.; Schofield, C.L. (Cornell Univ., Ithaca, NY). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Aluminum is evaluated as to its toxicity to fish with regard to the effects of acidification of fresh waters. This study may prove valuable when predicting these effects in other areas.

26362 (CONF-800365—, pp 294-295) **Effect of calcium on the toxicity of zinc and lead compounds in the water medium.** Chrost, L.; Pinko, L. (Division of Environmental Studies and Research in Power Industry, Gliwice, Poland). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Using the experimental pH values, it was found that concentrations of lead and zinc found in fly ash were decreased with calcium compounds in water solutions. This research is aimed at determining the effects of fly ash used for fertilizing waste land and dry forest soils.

26363 (CONF-800365—, pp 296-297) **Acid precipitation: the biotic response in Florida lakes.** Crisman, T.L.; Schulze, R.L.; Brezonik, P.L.; Bloom, S.A. (Univ. of Florida, Gainesville). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Alterations of water chemistry due to acid rain has resulted in alterations of the abundance of phytoplankton. Community studies of phytoplankton are currently underway in acidic Florida lakes.

26364 (CONF-800365—, pp 298-299) **Impact of acid precipitation on diatoms and chemistry of Dutch moorland pools.** Van Dam, H. (Research Inst. for Nature Management, Leersum, Netherlands); Suurmond, G.; Braak, C.T. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The effects of acid rain on diatoms in shallow Dutch lakes are discussed. Atmospheric sulfur concentrations being deposited in these pools are causing leaching of cations resulting in reduction of sulfates in these pools which contain humic acid.

26365 (CONF-800365—, pp 300-301) **River Hoegvadsan liming project: a presentation.** Edman, G. (Stadshuset, Falkenberg, Sweden); Fleischer, S. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A final evaluation of the liming project will be made in 1982 after four years of lime treatment. Some preliminary conclusions are: Lime addition to bogs, arable land and stream bottoms is insufficient at periods of high water discharge in the river. These measures only serve as complements to lime treatment of lakes and lime application from silos. Keeping a constant high pH in the lower part of the river is mainly obtained by lime treatment of lakes and by lime addition from silos. In order to guarantee a high pH in the lower part of the river during periods of heavy rain fall or rapid snow melt, lime (powder) must also be added from a truck into the watercourse. Practical problems with the use of silos are, e.g., con-

stant electric power supply (storm damage to power lines), constant pH measurement especially during the winter and lime transportation to the silos when much is added during periods of high water discharge.

26366 (CONF-800365—, pp 302-303) **Fallout, distribution and some effects of Zn, Cd, Pb, Cu and As in aquatic ecosystems near a base metal smelter on Canada's Precambrian Shield.** Franzin, W.G.; McFarlane, G.A. (Univ. Crescent, Winnipeg, Manitoba). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Long-range transport and deposition of metals in the atmosphere can be predicted and measured. Metal stress on fish was shown with the role of calcium ions participating in toxic uptake of contaminants.

26367 (CONF-800365—, pp 304-305) **Effects of acidification on the dynamics of allochthonous leaf material and benthic invertebrate communities in running waters.** Friberg, F.; Otto, C.; Svensson, B.S. (Lund Univ., Sweden). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Streams were compared to determine the effects of acidification on the decomposition of falling leaf input in autumn. Benthic invertebrates rely on this material as an energy source. Stream composition analysis with regard to functional groups of benthic species was done on two streams, one acidic, and one non-acidic. Differences were observed in benthic populations, but it is not known whether this difference is due to changes in detritus composition exposed to acidic water, or if there was a physiological change in benthic populations.

26368 (CONF-800365—, pp 308) **Genetic variation in acid tolerance in brown trout.** Gjedrem, T. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

It is possible to obtain a large improvement in survival rate of brown trout in acidic water by selective breeding. Ideally, a selection program should include crossbreeding.

26369 (CONF-800365—, pp 309) **Growth and survival of fingerlings in acidic water.** Gjedrem, T. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Comparative studies were done showing the growth and survival times of trout in acidic water conditions. The study was conducted over a four month span.

26370 (CONF-800365—, pp 310-311) **Fishkills in two moderately acid lakes due to high aluminum concentration.** Grahn, O. (Swedish Water and Air Pollution Research Inst., Kil). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Aluminum mobility due to acidification increases as pH is lowered. Effects of increased aluminum concentrations and a low pH value are toxic to fish. This paper focuses on a reconstruction of data showing fishkills in two Swedish lakes. The data verify the toxic observations that soils from around the lakes release aluminum.

26371 (CONF-800365—, pp 316) **Does the change of predator system contribute to the biotic development in acidified lakes.** Henrikson, L.; Oscarson, H.G.; Stenson, A.E. (Univ. of Gothenburg, Sweden). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This contribution extends the idea that relationships between predator and prey species may be affected by acidification of lakes. The possible impact of this hypothesis is a change in the ecology of the lake.

26372 (CONF-800365—, pp 318-319) **Acid stress in trout from a dilute mountain stream.** Leivestad, H. (Univ. of Bergen, Norway); Muniz, I.P.; Rosseland, B.O. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Experiments were carried out to determine the effects of acidic water on brown trout populations. A regional survey in Norway shows water chemistry of various areas. Biological stress to the brown trout is discussed.

26373 (CONF-800365—, pp 320-321) **Toxic effects of aluminum on the brown trout, Salmo trutta L.** Muniz, I.P. (Univ. of Oslo, Norway); Leivestad, H. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Aluminum toxicity was observed in brown trout. To gain a more thorough understanding of aluminum concentrations and pH levels, more experimentation is needed in this area to attempt to gain information on acidification processes.

26374 (CONF-800365—, pp 322-323) **Environment and snails (Gastropoda): studies of 1000 lakes in Norway.** Oekland, J. (Univ. of Oslo, Norway). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Using data from all areas of Norway, a number of species of snails were observed, and their tolerance to the pH level of the lake in which they were found was given. Water hardness and calcium concentrations were also recorded.

26375 (CONF-800365—, pp 324-325) **Mussels and crustaceans: studies of 1000 lakes in Norway.** Oekland, K.A. (Univ. of Oslo, Norway). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Tolerance limits were analyzed in this study on mussels and various crustaceans in lakes of Norway. As lake acidity increases, tolerance levels of these animals decreases. Other factors such as water hardness, and the altitude of the lakes above sea level were observed.

26376 (CONF-800365—, pp 326-327) **pH level and food organisms for fish: studies of 1000 lakes in Norway.** Oekland, J.; Oekland, K.A. (Univ. of Oslo, Norway). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Acidification of lakes in a Norwegian study indicates the disappearance of small aquatic organisms normally preyed upon by fish. This is due to their low tolerance of increasing pH levels of the lakes. This change of water quality may also lead to a drastic change in the entire ecology of those lakes.

26377 (CONF-800365—, pp 328) **Effects of low pH on hatching of Atlantic salmon eggs.** Peterson, R.H.; Daye, P.G.; Metcalfe, J.L. (Dept. of Fisheries and Oceans, St. Andrews, New Brunswick). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A study on salmon eggs was done to determine if they would hatch under acidic conditions. Acidification of lakes and streams in the natural environment may cause great losses in Atlantic salmon and other fish species due to the inability of eggs to hatch under those conditions.

26378 (CONF-800365—, pp 330-331) **Comparison of benthic invertebrates in lakes with different acidity.** Raddum, G.G. (Univ. of Bergen, Norway). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The possible effects of acidification described among benthic invertebrates are assumed to occur more and less concurrently. Only few species seem to be directly affected by low pH. High pH in lake water must not be regarded as an index of a healthy lake ecosystem in regions exposed to acid precipitation.

26379 (CONF-800365—, pp 332-333) **Phytoplankton and zooplankton in acidified lakes in South Norway.** Raddum, G.G. (Univ. of Bergen, Norway); Hobaek, A.; Loemsland, E.E.; Johnsen, T. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Species diversity of plankton was studied in a regional survey of Norway's southern lakes. The effects of acidification of their ecosystems has reduced their numbers, and may possibly have reduced their physiological size.

26380 (CONF-800365—, pp 334-335) **Fish in naturally acidic lakes of northern Wisconsin, USA.** Rahel, F.J.; Magnuson, J.J. (Univ. of Wisconsin, Madison). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Tolerance to natural acidity of lakes among fish populations in Wisconsin was studied by observing acclimation effects. There were comparisons made between different species of fish and their ability to adapt to various pH levels found in the lakes.

26381 (CONF-800365—, pp 336-337) **Studies on freshwater fish populations: effects of acidification on reproduction, population structure, growth and food selection.** Rosseland, B.O.; Sevaldrud, I.; Svalastog, D.; Muniz, I.P. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Data from this report are to be used primarily as a response from reference areas and to evaluate other data in comparison with these catch studies. The numbers of fish caught can help in determining the size of a fish population in some areas. Other areas of fish population dynamics are studied.

26382 (CONF-800365—, pp 342-343) **Effect of acid pH on sodium and chloride balance in an inhabitant of acid freshwaters: the waterbug Corixa punctata (Illig.) (Insecta, Hemiptera).** Vangenechten, J.H.D., Vanderborght, O.L.J. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

The effects of water acidity on sodium and chloride concentrations were studied. Waterbugs were found to have maintained their body salt balance even in acidic environmental conditions.

26383 (CONF-800365—, pp 346-347) **Physiological responses to acid water in fish. 1. Effects from changes in plasma osmolality and ion concentration on heart ventricle water content and intracellular concentrations of K^+ and taurine in the brown trout (Salmo trutta L.).** Fugelli, K. (Univ. of Oslo, Norway); Vislie, T. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This paper discusses the effects of acidic water and the changes on heart ventricle cell volume, by demonstrating a relationship between plasma Cl^- concentrations and tissue water, and extracellular water. This is important in determining the survival time for acid stressed fish.

26384 (CONF-800365—, pp 348-349) **Physiological responses to acid water in fish. 2. Effects of acid water on metabolism and gill ventilation in brown trout, Salmo trutta L., and brook trout, Salvelinus fontinalis Mitchill.** Rosseland, B.O. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

A discussion of the effects of acidification on trout species is given which also rationalizes aluminum toxicity in the respiratory process. Comparisons between brook and brown trout show the differences in species tolerance.

26385 (CONF-800365—, pp 350-351) **Loss of fish populations in Southern Norway. Dynamics and magnitude of the problem.** Sevaldrud, I.H. (Univ. of Oslo, Norway); Muniz, I.P.; Kalvenes, S. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This paper is a response to the severe consequences of acidification. Statistics show a major deterioration in fish populations in southern Norway, and speculation is given on the future of this problem.

26386 (CONF-800365—, pp 354-355) **Lake acidification, fish damage, and utilization of outfields. A comparative survey of six highland areas, southeastern Norway.** Drabloes, D.; Sevaldrud, I. Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

Corresponding data of water chemistry and fish population development in the investigated areas indicate a noticeable acidification and fish damage trend during the last 10 to 30 years, mainly in the lowest-buffering catchments. Brook-water analyses indicate that the water quality during the period of snow-melt was unsuitable for fish reproduction. A quantitative survey of a larger area and detailed studies of five smaller, indicate no interaction between changes in landuse and acidification of lakes in the investigated fields.

26387 (CONF-800365—, pp 375-376) **Ecologicall effects of experimental acidification on a stream ecosystem.** Hall, R.J.; Likens, G.E. (Cornell Univ., Ithaca, NY). Oct 1980. NTIS, PC A17/MF A01.

From International conference on the ecological impact of acid precipitation; Sandefjord, Norway (11 Mar 1980).

This paper discusses experimental effects of acidification and how it relates to natural mountain stream ecosystems. Biological stress on aquatic organisms due to altered pH levels, along with geochemistry is mentioned.

26388 **(CONF-810562—1) Repository support of synfuels health effects research.** Griest, W.H.; Guerin, M.R.; Yeatts, L.B. Jr. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01.

From U.S. EPA workshop on combustion products of synfuels; Alexandria, VA, USA (13 May 1981).

The purpose of the work of the Fossil Fuels Research Materials Facility is to actively support health effects research on synthetic fuels by supplying samples, data, and special service. The Facility acts as an interface for mutual exchange of materials and data between synthetic fossil fuels technologists and health effects investigators. Samples are catalogued in a computer inventory system, aliquotted, characterized, and distributed. Comparative matrix studies are described; results of the oil shale matrix study are given as an example. Most of these studies are concerned with the health effects of synthetic fuels combustion. Another area of support is the establishment of comparative research materials and conventional equivalents of synthetic fuels. An additional feature of Facility activities is the correlation of research results from various studies of synthetic fuels. (JGB)

26389 **(ORNL/TM—7721) Aryl hydrocarbon mono-oxygenase activity in human lymphocytes.** Griffin, G.D.; Schuresko, D.D. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 26p. NTIS, PC A03/MF A01. Order Number DE81025498.

Aryl hydrocarbon mono-oxygenase (AHM), an enzyme of key importance in metabolism of xenobiotic chemicals such as polynuclear aromatic hydrocarbons (PNA), is present in human lymphocytes. Studies investing the relation of activity of AHM in human lymphocytes to parameters such as disease state, PNA exposure, in vitro mitogen stimulation, etc. have been summarized in this report. Some studies have demonstrated increased AHM activity in lymphocytes from cigarette smokers (compared to nonsmokers), and in lung cancer patients when compared to appropriate

control groups. These observations are confused by extreme variability in human lymphocyte AHM activities, such variability arising from factors such as genetic variation in AHM activity, variation in in vitro culture conditions which affect AHM activity, and the problematical relationship of common AHM assays to actual PNA metabolism taking place in lymphocytes. If some of the foregoing problems can be adequately addressed, lymphocyte AHM activity could hold the promise of being a useful biomarker system for human PNA exposure.

26390 **(PB—81-800203) Nitrogen oxide air pollution: biological effects. 1964-August, 1980 (citations from the NTIS data base). Report for 1964-Aug 80.** Cavagnaro, D.M. (National Technical Information Service, Springfield, VA (USA)). Oct 1980. 206p. NTIS PC N01/MF N01.

The effects of nitrogen oxide air pollution on humans, plants, and animals are covered in the bibliography. Toxicology, epidemiology, pathology, and the synergistic effects of nitrogen oxides and other pollutants are covered. (This updated bibliography contains 210 citations, 28 of which are new entries to the previous edition.)

26391 **(PNL—3700Pt.2Suppl.) Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2 supplement, ecological sciences.** Vaughan, B.E. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 17p. NTIS, PC A02/MF A01.

This supplement replaces the list of Publications and Presentations in the Pacific Northwest Laboratory Annual Report for 1980 to the Assistant Secretary for Environment, PNL-3700 PT2, Ecological Sciences. The listings in the report as previously distributed were incomplete owing to changeovers in the bibliographic-tracking system.

26392 **(UR—3490-2026) Aerosol factors affecting respiratory deposition.** Morrow, P.E. (Rochester Univ., NY (USA). Dept. of Radiation Biology and Biophysics). 1981. Contract AC02-76EV03490. 13p. (CONF-810594—1). NTIS, PC A02/MF A01. Order Number DE81024425.

From Conference on deposition and clearance of aerosols in the human respiratory tract; Bad Gleichenberg, Austria (22 May 1981).

Aerosol deposition in the human respiratory system results from the interaction of the physical properties of the aerosol particles, the constantly changing dynamic character of the respired air, and the special architecture of the conducting airways and pulmonary parenchyma. These aspects broadly fall into two categories: those derived from the aerosol and those associated with the human respiratory system, per se. Of the former group, particle size is clearly the most significant and in this respect, two correlative attributes are reviewed and discussed; specifically, the hygroscopicity of particles and the heterodispersity of aerosols. The first topic, hygroscopicity, is discussed mainly in the context of the inconsistent data on respiratory humidification and temperature and their impact on hygroscopic growth models and particulate deposition estimations. The second topic considers the application of several models of respiratory functional anatomy and of aerosol deposition, the latter being based on monodisperse aerosol studies, to the estimation of the mass deposition of heterodisperse aerosols. This procedure is examined for aerosols having mass median aerodynamic diameter (MMAD) between 0.5 and 10 μm and geometric standard deviations (σ/sub g/) of 1.0 (ideally monodisperse), 2.0 (moderately heterodisperse), and 2.8 (highly heterodisperse). The mass deposition estimates based on monodisperse particles and these models were found to be satisfactory for heterodisperse aerosols with a σ/sub g/ of 2.0 or less. In general, the differences in absolute mass deposition fractions for each MMAD in all respiratory compartments varied by 0.05 or less from the deposition estimates using the same MMAD with a σ/sub g/ of 1.0. Variations in mass deposition implicit in different models are of this same order. Even greater changes in absolute deposition estimates can result from different breathing patterns.

26393 **Mortality in 191 counties near energy facilities: use of economic and social variables for standardization.** Dixon-Davis, D.K.; Collins, J.J.; Grahn, D. (Argonne National Lab., IL). Contract W-31-109-ENG-38. *Environmental Research ;* **25**: No. 1, 106-125(Jun 1981).

Standardization of mortality for variation in sociodemographic characteristics as well as for age, sex, and race is required for improved detection of changes in mortality around point sources of pollution. Mortality by level and selected causes was studied in 191 counties within 80 km of 15 power generation sites chosen to represent the diversity of US socioeconomic, demographic, and geographic features. Mortality data for 1969 to 1971 were evaluated against selected 1970 US census, air pollution, climate, and cigarette and beer consumption data. A mortality process scheme was developed and used to rationalize the selection of independent variables. Applying this technique to regressions of mortality on air pollution and social-demographic variables, only female mortality was found to have strong independent or interactive effects with air pollution. For cause-specific mortality, the explained variance was small for diseases with major genetic components and larger for diseases with strong socioeconomic components. Testing of the regression equations indicated that standardization for socioeconomic factors may be a useful strategy on a regional basis.

26394 **Evaluation of toxicant effects on structure and function of model stream communities: correlations with natural stream effects.** Maki, A.W. (Procter and Gamble Co., Cincinnati, OH). pp 583-609 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

The effects of a toxicant, the lampricide, 3-trifluoromethyl-4-nitrophenol (TFM), on the biological structure and function of six indoor model streams were examined and correlated with effects observed during field treatments of a natural stream. The experimental design was to stimulate actual lamprey-control treatments within the model and natural systems. Sampling programs were designed to permit examination of correlation between the biological effects in the two systems in an attempt to provide a statistical basis for validating laboratory stream data. No effects of the lampricide exposure could be demonstrated on periphyton community structure, including biomass and species compostion of diatoms and filamentous green algae. A statistically significant decrease in the total number of macroinvertebrates per unit area was observed after treatment of the natural and model streams. A fourfold increase in drift rates of TFM-susceptible species was observed in the natural stream and experimental channels during treatment. Complete recovery to pretreatment densities was observed from measurements of diversity, equitability, number of taxa, and secondary production rates of the macroinvertebrate community. Correlations between effects observed in the indoor model streams and in a natural outdoor stream indicate that relevant conclusions of environmental effects of chemical substances can be drawn from controlled laboratory simulations of flowing-water ecosystems.

26395 **Stream microcosm for environmental assessment of pesticides.** Coats, J.R. (Univ. of Guelph, Ontario). pp 715-723 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

A laboratory microcosm for evaluating the fate and effects of a chemical in a cold, fast trout stream is described. This simulation of a turbulent, highly oxygenated stream uses a magnetic stirring unit and stir bar to generate a rapid current in a squat, circular, 8-liter aquarium. Conditions created can sustain components of one food chain that exists in a trout-stream habitat - the filter-feeding blackfly larva (Simulium sp.) and the predator rainbow trout (Salmo gairdneri Richardson). The blackfly larvae are fed on brewer's yeast or bacteria that have been pretreated with the pesticide to be studied. Experimental results demonstrate the type of data obtained from investigations on bioaccumulation, as well as the rates and mechanisms of uptake. The system also lends itself to use in degradation, toxicity, and rearing studies. The retention of stream oxygenation and flow characteristics and the use of an important naturally occurring food chain are advantages that contrib-

ute to the utility of the circular stream microcosm as a research tool in aquatic toxicology.

26396 Trophic interactions in experimental marine ecosystems perturbed by oil. Elmgren, R. (Univ. of Rhode Island, Kingston); Vargo, G.A.; Grassle, J.F.; Grassle, J.P.; Heinle, D.R.; Langlois, G.; Vargo, S.L. pp 779-800 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Chronic, low-level additions of No. 2 fuel oil were made to three of nine experimental tanks (mean concentration, 180 ppB; range, approximately 60 to 350 ppB) at the Marine Ecosystems Research Laboratory. Laboratory experiments indicated that the dominant phytoplankton species were relatively insensitive to oil at these concentrations but the phytoplankton populations in the ecosystems receiving oil showed a marked increase in biomass and radically different species composition. The evidence suggests that these changes were caused by the reduced grazing pressure in the oiled tanks, where the densities of zooplankton and benthic suspension feeders were markedly lower than in the control tanks. Nutrient studies in control and oiled tanks support this interpretation. Nutrients in control tanks were generally present in excess but were generally limiting for the elevated phytoplankton populations in the oiled tanks. During the 5-month chronic oil addition, the benthic macrofaunal and metazoan meiofaunal populations declined drastically, whereas benthic protozoa (ciliates and Foraminifera) increased considerably, as did benthic diatoms. The increases may be caused by decreased bioturbation, predation, and grazing by the reduced metazoan populations. These effects could have been predicted from knowledge of the biology and susceptibility to oil of the individual species and emphasize the usefulness of replicated experimental ecosystems in further analysis of such interactions.

26397 Environmental destinies of insecticides, herbicides, and fungicides in the plants, animals, soil, air, and water of homologous microcosms. Cole, L.K. (Univ. of Massachusetts, Amherst); Metcalf, R.L. pp 971-1007 of Microcosms in ecological research. Giesy, J.P. Jr. (ed.). Oak Ridge, TN; Technical Information Center (1980).

From Symposium on the Savannah River Ecology Laboratory; Augusta, GA, USA (8 Nov 1978).

Since it is necessary to know where and to what extent a poison is environmentally located to judge whether it is hazardous, this paper summarizes the relocations of 15 radioactively tagged pesticides and their transformation products within the physical and biological components of a newly developed terrestrial microcosm with an aquatic phase. Readily observable toxic effects are described, as are pesticidal bioaccumulations in vertebrate and invertebrate animals and in plants. Emphasis was placed on tracing the fate of the pesticide and its transformation products in soil, air, water, Zea mays, Glycine max, Lumbricus terrestris, Limax maximus, Armadillidium vulgare, Estigmene acrea, and Microtus ochrogaster in the terrestrial phase and in Gambusia affinis, Physa spp., Daphnia magna, and Culex pipiens quinquefasciatus in the aquatic phase. The ^{14}C-labeled pesticides examined included 2,4,5-T isooctyl ester, simazine, trifluralin, hexachlorobenzene, pentachlorphenol, pentachloronitrobenzene, captan, phorate, fonofos, parathion, methyl parathion, aldrin, dieldrin, DDT, and methoxychlor.

5604 Other Environmental Pollutant Effects

REFER ALSO TO CITATION(S) 26200

26398 (AD-A—090426) Effects of low power microwaves on the local cerebral blood flow of conscious rats. Oscar, K.J. (Army Mobility Equipment Research and Development Command, Fort Belvoir, VA (USA)). Jun 1980. 10p. NTIS, PC A02/MF A01.

A decoy and deception concept presently being considered is to remotely create the perception of noise in the heads of personnel by exposing them to low power, pulsed microwaves. When people are illuminated with properly modulated low power microwaves the sensation is reported as a buzzing, clicking, or hissing which seems to originate (regardless of the person's position in the field) within or just behind the head. The phenomena occurs at average power densities as low as microwatts per square centimeter with carrier frequencies from 0.4 to 3.0 GHz. By proper choice of pulse characteristics, intelligible speech may be created. Before this technique may be extended and used for military applications, an understanding of the basic principles must be developed. Such an understanding is not only required to optimize the use of the concept for camouflage, decoy and deception operations but is required to properly assess safety factors of such microwave exposure.

26399 (EPRI-EA—1855) Impingement and entrainment: an updated annotated bibliography. Final report. Yost, F.E.; Uziel, M.S. (Atomic Industrial Forum, Inc., Washington, DC (USA); Oak Ridge National Lab., TN (USA)). May 1981. Contract W-7405-ENG-26. 327p. NTIS, PC A15/MF A01.

Presented as an annotated bibliography are 1343 references dealing with entrainment and impingement effects on aquatic organisms passing through the cooling systems of thermal power plants. The references were obtained from open literature and from environmental reports and impact statements prepared by or for the electric utility industry. Two earlier bibliographies contain literature from 1950 through 1976. This update contains additional literature acquired since 1976. Topics covered are site-specific field studies at facilities located on lakes, reservoirs, rivers, or estuaries. The studies include special engineering studies, laboratory studies, studies of biological effects, reviews and methodologies, and studies of the mitigation of effects. References are arranged alphabetically by author, and indexes are provided to personal and corporate authors, and to facility, waterbody, and taxonomic names.

26400 (LBL—12589) Ventilation requirements for control of occupancy odor and tobacco smoke odor: laboratory studies. Final report. Cain, W.S.; Isseroff, R.; Leaderer, B.P.; Lipsitt, E.D.; Huey, R.J.; Perlman, D.; Bergland, L.G.; Dunn, J.D. (Lawrence Berkeley Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 64p. NTIS, PC A04/MF A01.

Experiments on occupancy odor addressed the question of why required ventilation rate per occupant increased progressively with increases in the number of persons in a space. In order to investigate ventilation requirements under approximately ideal conditions, we constructed an aluminum-lined environmental chamber with excellent control over environmental conditions and a ventilation system that provided rapid and uniform mixing of air. Psychophysical experiments on occupancy odor explored 47 different combinations of occupancy density, temperature and humidity, and ventilation rate. The experiments collected judgements both from visitors, who smelled air from the chamber only once every few minutes, and from occupants, who remained in the chamber for an hour at a time. The judgements of visitors revealed that occupancy odor increased only gradually over time and rarely reached very high or objectionable levels. Judgements of occupants also revealed rather minor dissatisfaction. Only during combinations of high temperature and humidity did objectionability become more than a minor issue to either group. Experiments on cigarette smoking explored rates of 4, 8, and 16 cigarettes per hour under various environmental conditions and with ventilation rates as high as 68 cfm (34 $L.s^{-1}$) per occupant. As soon as occupants lit cigarettes in the chamber, the odor level increased dramatically. At ventilation rates far greater than necessary to control occupancy odor, the odor from cigarette smoking remained quite intense. In general, the odor proved impossible to control adequately even with a ventilation rate of 68 cfm (34 $L.s^{-1}$) per occupant (4 occupants) and even when only one occupant smoked at a time. As in the case of occupancy odor, a combination of high temperature and humidity exacerbated the odor problem.

26401 (UR—3490-2024) Assessment of health impacts from electrical-power transmission lines. Miller, M.W. (Rochester Univ., NY (USA)). 1980. Contract AC02-76EV03490. 16p. NTIS, PC A02/MF A01. Order Number DE81025192.

The types of investigations undertaken to test for possible biological effects of extremely low frequency (ELF) electric fields

have been numerous. However, neither animal and plant experimentation nor clinical studies nor experience with operating extremely high voltage (EHV) transmission lines have to-date provided convincing evidence of a harmful effect from exposure to electric fields associated with transmission lines in spite of numerous attempts to find such effects. Analysis of internal fields and currents supports these observations as the levels appear to be too low to affect mammalian cells. Thus, while one can never prove the negative (i.e., that there is no effect), the overwhelming body of evidence indicates that the electric fields associated with high voltage lines have no deleterious biological effects.

57 HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 25735, 26076, 26317

26402 (CONF-8008109—1) Reduced-form approach for evaluating hospital cost-containment program in paired experiment. Liu, B.C. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01. Order Number DE81023103.

From Business and economic statistical conference; Washington, DC, USA (11 Aug 1980).

The paper investigates the feasibility, analyzes the project benefit, and establishes the cost-1 effectiveness of the Cooperative Utilization Review Program (CURP), the action plan for cost containment proposed by the Blue Cross and Blue Shield Company. A statistical evaluation framework is developed for analyzing the effects of the CURP through control and participating hospital selection, impatient discharge data collection, and the average length of stay delineation and explanation by diagnosis. (ACR)

26403 (SAND—81-0640) Guidance for implementing an Environmental, Safety and Health Assurance Program. Volume 9. Model guidelines for environmental safety and health analysis activities. Trauth, C.A. Jr.; Marston, K. (Sandia National Labs., Albuquerque, NM (USA); Tech. Reps., Inc., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 70p. NTIS, PC A04/MF A01. Order Number DE81025319.

This is 1 of 15 documents written to illustrate how an ES and H Assurance Program might be defined and implemented. This document addresses a critical aspect of ES and H Assurance Programs - namely, how one might flexibly and cost-effectively recognize the significant hazards present in one's operations or associated with one's products and how controls over these hazards might be derived and selected so that they are acceptable to employees and the public.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 24990, 25015, 25127, 25135, 25136, 25568, 25569, 25734, 26096, 26205, 26277

26404 (LBL—12076) Third invitational well-testing symposium: well testing in low permeability environments. Doe, T.W.; Schwarz, W.J. (eds.). (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 176p. (CONF-800344—). NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

The testing of low permeability rocks is common to waste disposal, fossil energy resource development, underground excavation, and geothermal energy development. This document includes twenty-six papers and abstracts, divided into the following sessions: opening session, case histories and related phenomena, well test design in low permeability formations, analysis and interpretation of well test data, and instrumentation for well tests. Separate abstracts were prepared for 15 of the 16 papers; the remaining paper has been previously abstracted. (DLC)

26405 (LBL—12076, pp 15-37) Some experiences from well testing in precambrian rocks of Sweden. Almen, K.E.; Carlsson, L.; Hansson, K. (Geological Survey of Sweden, Uppsala,). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

A great number of drillings, well tests and other investigations were performed to show the existence of sufficiently large volumes of rock with very low groundwater flow suitable for a radwaste repository. A total of about 12,000 meters of boreholes were drilled and investigated. In the two areas Finnsjoen and Sternoe, almost 7700 meters of boreholes were investigated and the results formed the basis for the KBS safety-analysis for a repository in crystalline rock in accordance with the requirements of the Swedish Stipulation Law (KBS 1977, 1978). In this paper a brief review is presented of the hydraulic well-test performed and some experiences from the testing and the results.

26406 (LBL—12076, pp 38-44) Large-scale permeability testing at Stripa. Long, J.C.S.; Witherspoon, P.A.; Wilson, C.R.; DuBois, A.O. (Lawrence Livermore Lab., CA). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

The macropermeability experiment at Stripa, Sweden, is an attempt to measure the average permeability of a very large volume of low-permeability, fractured rock. A test at ambient temperature has been completed. Preliminary results estimate a hydraulic conductivity of about 6.5×10^{-11} m/s.

26407 (LBL—12076, pp 45-50) In situ premeability measurements for an underground compressed air storage project. Voegele, M.; McCain, R.; Gronseth, M.; Pratt, H. (Terra Tek, Inc., Salt Lake City, UT). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

Seven injection tests were conducted to determine permeability as part of a site investigation for a proposed compressed air energy storage/underground pumped hydro facility located in Maryland. The tests were conducted in a single NX borehole to depths of approximately 1000 meters in the Sykesville granitic gneiss formation. Four of the injection tests were single packer tests and were to determine the permeability of a large section of the hole. The tests were performed starting near the top of the hole and the packers were moved down the hole for each successive test. Three straddle packer tests were performed to determine the rock matrix permeability of two fractured zones. The interval tested during the straddle-packer tests was 28.2 meters long. From these tests, it appears that the rock matrix permeability is on the order of 10^{-18} cm^2 or less, and that the average permeability in the fractured zones tested is on the order of 10^{-12} cm^2. 4 figures, 1 table.

26408 (LBL—12076, pp 67-73) Some considerations for tracer tests in low permeability formations. Thompson, G. (Univ. of Arizona, Tucson). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

Tracing experiments in low permeability formations are used primarily for measurement of porosity and dispersivity. In some cases they are used for measuring the direction and rate of water movement. Well layouts and test types are as variable as the situations in which they have been applied. In addition a correspondingly large variety of tracers have been used in the past eighty years to perform these tests. In order to provide some basic guidelines for performing tracer tests in low permeability formations, several conventional tracing techniques and a listing of the most commonly used tracers are given. 7 figures.

26409 (LBL—12076, pp 74-83) Injection versus pressure pulse borehole tests in fractured crystalline rocks: observations and recent experiences. Forster, C.B.; Gale, J.E. (Univ. of Waterloo, Ontario). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

In the laboratory, transient pressure pulse tests and steady-state flow tests were performed on a sample of Stripa Granite core (11 cm long and 4.5 cm in diameter) containing a single natural fracture parallel to and centered on the core axis. The test configuration simulated a full scale borehole test cavity using borehole seals of various compliances in a 76 mm steel tube. Test results indicate a good correlation between steady-state and transient conductivity determinations. Packer compliance was found to cause underestimation of sample conductivity by up to a factor of 2. With decreasing sample permeability the significance of packer compliance was found to increase. In the field, transient pressure pulse tests and steady-state flow tests were performed in an array of boreholes collared 338m below ground in a fractured crystalline rock mass. There is no apparent correlation between results of each test type. In order to determine the radius of influence of in-situ pressure pulse tests in low-permeability fractured rocks, the volume of water in the test cavity and the monitoring cavities must be the same order of magnitude as the volume of water in the rock mass influenced by the test. 10 figures.

26410 (LBL—12076, pp 84-89) **Analysis of constant-head well tests in nonporous fractured rock.** Doe, T.; Remer, J. (Lawrence Berkeley Lab., CA). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

If one compares the results of steady analyses and transient flowrate analyses, the error in assuming steady flow is less than an order of magnitude for reasonable values of storativity, and this error can be minimized through proper choice of radius of influence. Although the steady flow assumptions do not result in large errors in the calculation of permeability, careful design of constant-head well tests can yield not only storativity, but also qualitative information on the areal extent of permeable zones or fractures tested. Constant-head well tests have several major advantages over other well test techniques in low permeability rock. Unlike pump tests, wellbore storage effects are virtually nonexistant. Provided low-flow measurement apparatus is available, constant-level tests are far more rapid than slug tests and, unlike pulse tests, compliance of equipment is not a factor, since the system is maintained at constant pressure throughout the test.

26411 (LBL—12076, pp 90-93) **Solute tracer tests in fractured media.** Grisak, G.E. (National Hydrology Research Inst., Ottawa, Ontario). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

A single-well injection-withdrawal tracer test design with radial satellite instrumentation is used to illustrate design calculations for testing a single 100 μm fracture. Test durations of several days can conceivably provide tracer information over distances of tens of meters at realistic injection pressures. Calculations of the effect of matrix diffusion on the test results show that only in rocks with low (< 0.01) matrix porosity would average solute velocities be obtained comparable to those based on the design injection conditions. Matrix diffusion in rocks with high matrix porosity would cause solute velocities to be much slower than the water velocity. It is considered that the primary function of a conservative (nonreactive) tracer is to provide verification of the average velocity in a fracture, usually calculated from hydraulic testing results. Reactive and nonreactive tracers used together can provide substantial information on in situ sorption properties if used in conjunction with radial instrumentation.

26412 (LBL—12076, pp 96-102) **Measurement of in-situ hydraulic conductivity in the Cretaceous Pierre Shale.** Neuzil, C.E.; Bredehoeft, J.D. (Geological Survey, Reston, VA). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

A recent study of the hydrology of the Cretaceous Pierre Shale utilized three techniques for measuring the hydraulic conductivity of tight materials. Regional hydraulic conductivity was obtained from a hydrodynamic model analysis of the aquifer-aquitard system which includes the Pierre Shale. Laboratory values were obtained from consolidation tests on core samples. In-situ values of hydraulic conductivity were obtained by using a borehole slug test designed specifically for tight formations. The test is conducted by isolating a portion of the borehole with one or two packers, abruptly pressurizing the shut-in portion, and recording the pressure decay with time. The test utilizes the analytical solution for pressure decay as water flows into the surrounding formation. Consistent results were obtained using the test on three successively smaller portions of a borehole in the Pierre Shale. The in-situ tests and laboratory tests yielded comparable values; the regional hydraulic conductivity was two to three orders of magnitude larger. This suggests that the lower values represent intergranular hydraulic conductivity of the intact shale and the regional values represent secondary permeability due to fractures. Calculations based on fracture flow theory demonstrate that small fractures could account for the observed differences.

26413 (LBL—12076, pp 103-109) **Analysis of pumping tests performed in a horizontal rectangular fracture.** Thiery, D. (Bureau de Recherches Geologiques et Minieres, Orleans, France). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

The analytical solution has been derived for a constant rate uniform flux pumping test in a single horizontal rectangular fracture. The solution is given for the drawdown at the pumped well and at an observation well inside or outside the fracture. A set of type curves which depend on two dimensionless parameters has been drawn. These type curves give the dimensionless drawdown at the pumped well versus the dimensionless time according to the shape factor of the fracture and the dimensionless aquifer thickness. Another set gives the average drawdown along the vertical at an observation well versus dimensionless time depending on the dimensionless distance and the shape factor. For both the drawdown at the pumped well and at an observation well the solution has also been studied for early times and long times in order to derive approximative solutions which are compared to the well known solutions in isotropic aquifers. 5 figures.

26414 (LBL—12076, pp 120-129) **Aquifer response to earth tides.** Kanehiro, B.Y.; Narasimhan, T.N. (Lawrence Berkeley Lab., CA). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

The relation presented in the first part of this paper are applicable to packed-off wells and other situations where appreciable flow to the well does not exist. Comparisons of aquifer properties determined from the response to earth tides and from the more standard pumping tests for the two California fields are reasonably good. The case of an open well makes the problem more complicated, since there may be an appreciable amount of flow to the well. This flow to the well is seen as either a phase lag or as a difference in the ratio of the well signal to the tide for the semidiurnal and diurnal components of the tide. The latter is probably the better and more accurate indicator of flow to the well. Analyses of such situations, however, become involved and are probably best done as case-by-case studies. The numerical solutions show that treating the inverse problem through numerical modeling is at least feasible for any individual situation. It may be possible to simplify the inverse problem through the generation of type curves, but general type curves that are applicable to diverse situations are not likely to be practical. 7 figures.

26415 (LBL—12076, pp 153-156) **Instrumentation for determining rock mass permeability by hydro-pneumatic pressure testing.** Miller, W.O. (US Army Engineer Waterways Experiment Station, Vicksburg, MS). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

In order to eliminate the problems encountered with existing pressure test equipment, a downhole control unit was designed for conducting tests in NX boreholes. The unit maintains a preset minimum differential pressure between the packers and the test section, and controls inflation and deflation of the packers. The packer response to inflation and deflation commands is greatly increased in deep borings since the control unit is located downhole, and inflation is accomplished with the testing fluid (which is normally either

water or air). For increased flexibility, the control unit was designed with the capacity for operating as either a single- or double-packer system by the use of simple ground surface control commands.

26416 (NUREG/CR—1621) A characterization of faults in the Appalachian foldbelt. Odom, A.L.; Hatcher, R.D. Jr; Dunn, D.E.; Engelder, T.J.; Geiser, P.A. (Florida State Univ., Tallahassee (USA)). Sep 1980. 325p. NTIS, PC A14/MF A01.

The characterization is a synthesis of available data on geologic faults in the Appalachian foldbelt regarding their description, generic implications, rate of movement, and potential as geologic-seismic hazards. It is intended to assist applicants and reviewers in evaluating faults at sites for nuclear facilities.

26417 (RHO-BWI-C—56) Review of water-well data from the unconfined aquifer in the eastern and southern parts of the Pasco Basin. Brown, R.E. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Sep 1979. Contract AC06-77RL01030. 546p. NTIS, PC A23/MF A01.

Maps.

An overview of the post-Columbia River basalt geology and shallow hydrogeology of the Pasco Basin for areas adjacent to the Hanford Site is presented. The lithostratigraphic units described include the surface of the Columbia River basalt; the basal gravels, silts and clays, and conglomerates of the Ringold Formation; and the Hanford formation (informal name). Discussions regarding the occurrences, hydraulic properties, and flow characteristics of the shallow (unconfined) groundwater systems are described for six subareas within the study region. Empirical transmissivity values are tabulated for 209 wells and 11 plates provide geologic and hydrologic data at a 1:62,500 scale for the study area.

26418 Natural annealing of pleochroic haloes in biotite samples from deep drill holes, Fenton Hill, New Mexico. Laney, R.; Laughlin, A.W. (Geosciences Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Geophysical Research Letters ;* **8**: No. 5, 501-504(May 1981).

Examination of 46 thin-sections of Precambrian metamorphic and igneous rocks from three deep drill holes in northern New Mexico reveals a narrow depth-temperature range for annealing of pleochroic haloes in biotite. Annealing of the haloes is first observed in samples from a depth of 1850 m (134°C present temperature) and is complete in samples from a depth of 2120 m (151°C). The observed temperature of annealing of the haloes is in good agreement with earlier observations of fission track annealing in apatite from the same core samples.

5802 Geophysics

REFER ALSO TO CITATION(S) 25170, 25171

26419 (NUREG/CR—1643) Geotechnical data from accelerograph stations investigated during the period 1975-1979. Summary report. (Shannon and Wilson, Inc., Seattle, WA (USA); Agbabian Associates, Seattle, WA (USA)). Sep 1980. Contract NRC-04-76-200. 167p. NTIS, PC A08/MF A01.

This report summarizes geotechnical data that was obtained in the investigation of 83 accelerograph stations located in the United States. These stations were studied during the period from 1975 to 1979 and the detailed findings are contained in nine data reports. Summary logs indicating subsurface soil conditions and material properties have been prepared for each of the accelerograph stations. A classification system was devised for grouping the stations as either rock sites, stiff soil sites or deep soil sites. Using this classification system, simple ground motion plots have been prepared which qualitatively indicate the dependency of earthquake motions on local site conditions. This classification system may be used in more elaborate and quantitative studies of the influence of local site conditions upon earthquake ground response. On a practical engineering level, the site classification system and the results of the individual site investigations may be used in selecting earthquake records to establish seismic design criteria. Further research of the subsurface conditions at additional accelerograph stations is needed to increase the data base of earthquake records and recording stations.

26420 (UCRL—53127) Detection of water-filled and air-filled underground cavities. Laine, E.F. (Lawrence Livermore National Lab., CA (USA)). 1 Dec 1980. Contract W-7405-ENG-48. 18p. NTIS, PC A02/MF A01. Order Number DE81025123.

Tunnel and cavern detection methods were tested at two experimental sites in Florida. Cross-borehole methods using high-frequency electromagnetic wave diffraction techniques were used over a frequency range of 1 to 100 MHz. A new cross-borehole method using direct current was also used. The experimental sites are karstic. The caverns and tunnels were water-filled at one site and dry at the other site.

26421 Eighteenth annual symposium on engineering geology and soils engineering. Boise, ID; Boise State University (1980). 357p. (CONF-800412—). NTIS, PC A16/MF A01.

From 18. annual symposium on engineering geology and soils engineering; Boise, ID, USA (2 Apr 1980).

Items within the scope of EDB are entered individually. (ACR)

26422 Volcanic and seismic hazards on the eastern Snake River Plain, Idaho. pp 81 of Eighteenth annual symposium on engineering geology and soils engineering. Niccum, M. (Woodward-Clyde Consultants, San Francisco, CA); Cline, K.M.; Jackson, M. Boise, ID; Boise State University (1980).

From 18. annual symposium on engineering geology and soils engineering; Boise, ID, USA (2 Apr 1980).

Volcanic eruptions have occurred on the eastern Snake River Plain in Holocene time. There is no apparent active volcanism now, but the volcanic processes must be assumed to be dormant rather than extinct. A renewal of volcanism could lead to both volcanic and seismic hazards. This comparative study categorized and described primary volcanic structures exposed on the plain: rift systems, rift sets, eruptive fissures, tension fissures, rift-line graben, faults, lineaments, fissure flows, low-shield volcanoes, cinder cones and rhyolite domes. Documented volcanic events from other volcanic provinces were evaluated and compared to volcanic structure on the Snake River Plain. Only modern volcanic events having both visual observations and instrumental records were used in the comparative study. Most volcanic provinces studied contain all the volcanic structures found on the plain, as well as structures not found on the plain, such as large faults, large volcanoes, and calderas from phreatomagmatic explosions. One major difference is the occurrence of large faults. In Idaho, the large faults occur in the block-faulted mountains adjacent to the volcanic plain. Thus, whereas earthquakes will probably accompany a renewal of volcanism, the large damaging earthquakes would be expected to occur on the known active faults in the mountains surrounding the plain. Seismic hazards are predicted by conventional methods, even if the event is triggered by a renewal of volcanism.

26423 Ground rupture and seismic shaking as separate hazards of active faults (a study of active faulting in the Ojai Valley, Southern California). Clark, M.N. pp 83-96 of Eighteenth annual symposium on engineering geology and soils engineering. Boise, ID; Boise State University (1980).

From 18. annual symposium on engineering geology and soils engineering; Boise, ID, USA (2 Apr 1980).

Active faults pose two kinds of hazards that require evaluation by engineering geologists: (1) ground rupture that damages or destroys structures built across the fault; (2) seismic shaking that occurs during earthquakes. Usually hazard analysis of active faulting has dealt with these two problems as one. However, active faults in the Ojai Valley, western Transverse Ranges, southern California are associated with ground rupture of Holocene colluvium and soil but project along bedding surfaces into the axis of an underlying syncline. These faults do not cut across structure nor reach rocks of sufficient strength to produce moderate or large earthquakes. Hazard of seismic shaking is therefore considered to

be minimal while ground rupture is significant. Similar types of faults, from an earthquake hazard perspective, include tensional faults along the crest of an anticline, faults due to surface subsidence and faults related to large landslides. It is not sufficient for engineering purposes to evaluate only the activity of a fault. A given fault must be analyzed in a geotechnical evaluation for its relationship to local geologic structure so that ground rupture and seismic shaking can be considered separately.

26424 **Estimating seismic hazards using past rupture patterns of faults near the eastern Snake River Plain, Idaho.** Cline, K.M. (Woodward-Clyde Consultants, San Francisco, CA); Niccum, MM.; Jackson, M. pp 97-98 of Eighteenth annual symposium on engineering geology and soils engineering. Boise, ID; Boise State University (1980).

From 18. annual symposium on engineering geology and soils engineering; Boise, ID, USA (2 Apr 1980).

A recently compiled US Geological Survey open-file map shows long, continuous, suspected active faults along the range fronts of the Lost River, Lemhi, and Beaverhead Ranges of central Idaho. Trenching studies at selected sites have revealed evidence of late Pleistocene and/or Holocene faulting. Thus, it can be assumed that faults in that region have the potential for producing damaging earthquakes. The current study was undertaken to evaluate past fault behavior to predict future fault rupture patterns and how the faulting would affect seismic hazards on and near the Snake River Plain. Standard photogeologic methods, aerial reconnaissance under standard and low-sun-angle conditions, and limited ground reconnaissance were used to gather data. Several hundred linear features were mapped in and adjacent to the suspected active faults. The study area was within 20 to 30 miles to Snake River Plain in the Arco Hills, Lost River Range, and the Lemhi Range. A preliminary lineament evaluation scheme was formulated to categorize the lineaments based on different apparent hazards, apparent age, and/or the geologic processes involved in the creation and preservation of the feature. The evaluation scheme was based on a knowledge of geologic and geomorphologic processes in the area and a reconnaissance study of fault scraps of various known ages in southern Montana, eastern Wyoming, and the mountainous regions north of the Snake River Plain.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 24898, 24997, 24998, 24999, 25142, 26620

26425 **(DOE/ER/04054—5) Time-dependent transmissivity of joints. Progress report, July 1, 1980-June 30, 1981.** Scholz, C.; Engelder, T. (Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory). Apr 1981. Contract AS02-76ER04054. 15p. NTIS, PC A02/MF A01.

In order to understand the effect of fracture closure on permeability, the precise effects of changing fluid pressure on the rate of flow along smooth joints in rock at effective pressures to 300 MPa are being studied. Current studies include measurements of the influence on flow of fracture filling or gouge along the joint surface. Results from smooth joints indicate that at low pressures (<20 MPa) permeability approximately follows the d^3-law for fluid flow between parallel plates. At much higher pressures where joint apertures (d) are less than 10 μm, permeability decreases faster with d than as d^3. Two effects are seen when fracture filling which resembles a cataclastic gouge of angular fragments fills the joint. For a filling of uniform particles about 25 μm in diameter, the permability decreases faster with d than as d^3. For a poorly sorted gouge consisting of particles varying 25 μm to submicron in size, permeability varies less rapidly with d than as d^3.

26426 **(DOE/ER/10762—1) Effect of strain rate and stress corrosion on the long-term strength of crystalline rocks. Progress report, September 1, 1980-March 15, 1981.** (Pennsylvania State Univ., University Park (USA)). 1981. Contract AC02-80ER10762. 4p. NTIS, PC A02/MF A01.

A series of experiments has been initiated to determine the effect of pore water pressure, temperature and strain rate on the strength of brittle crystalline rocks. Specifically a granite will be tested at an effective confining pressure of 300 bars at strain rates between 10^{-5} and $10^{-8}sec^{-1}$ over a temperature range of 100° to 300°C. The pore pressure will be varied between 0.1 and 300 bars. In this way the rate of decrease in strength with decreasing strain rate can be determined for each pore water pressure. The resulting map of fracture strength as a function of temperature, strain rate and water pressure will provide a useful framework for extrapolating to the long term strength of the repository rock as well as providing a background for additional experiments on the creep and static fatigue of crystalline rocks. Over the first five months of the contract period, most of the time has been spent designing the experiment in detail, ordering the necessary material, preparing rock samples, fabricating and calibrating furnaces and assembling the gas confining pressure system.

26427 **(DOE/ER/10765—T1) Thermodynamic properties of crystals and melts based on calorimetric data and plagioclass-melt equilibria in the system albite-anorthite-diposide.** Henry, D.J.; Navrotsky, A.; Zimmermann, H.D. (Arizona State Univ., Tempe (USA). Dept. of Chemistry). May 1981. Contract AC02-80ER10765. 46p. NTIS, PC A03/MF A01. Order Number DE81024473.

Thermochemical data for high plagioclase (P) solid solutions and for glasses in the system albite-anorthite-diopside (AAD) can be coupled with the heats of fusion of albite and anorthite, ion exchange equilibria between P crystal and aqueous fluid, and coexisting P and melt compositions in AAD to produce a consistent model of mixing properties in crystals and melts in AA. The crystalline high temperature Ps are described by positive heats of mixing and the aluminum-avoidance entropy model of Kerrick and Darken (1975), leading to positive deviations from Raoult's Law below 1000°K, conformity at intermediate temperatures (~ 1500 K), and negative deviations above > 1750°K. This model predicts P exsolution with cmpositions in the region of Boggild and Huttenlocher intergrowths but provides no evidence for the peristerite gap. Liquids in the region of the P saturation surface of AAD are shown to have entropies of mixing significantly less positive than predicted by the two-lattice model of Weill et al. (1980), which was adequate for the pyroxene saturation surface of that system. Along the AA binary these deviations are not consistent with aluminum avoidance in the liquid, but can be described by an empirical regular excess entropy term or the assumption of strong Ca-Al charge balance. The AA binary liquidus loop can be calculated in satisfactory agreement with experiment.

26428 (LBL—12076, pp 51-63) **Capillary effects in rocks of the earth: influence on well behavior.** Katz, D.L. (Univ. of Michigan, Ann Arbor). Mar 1981. NTIS, PC A09/MF A01.

From 3. invitational well testing symposium; Oakland, CA, USA (26 Mar 1980).

This paper sets forth concepts on capillary properties in the rocks of the earth which might be helpful in understanding the production of fluids from tight rocks. In underground gas storage, especially in aquifers, it became important to understand caprocks - the mechanism by which gas is held indefinitely in the earth. From studies of low permeability rocks, interest was developed in the fluid content of all rock layers of the earth. Capillary effects which are controlling in most caprocks are very significant in fluid flow in all low permeability rocks containing two phases.

26429 **(RHO-BWI-SA—67) Relationships between internal structures and petrographic textures of basalt flows: example from a continental flood tholeiite province.** Long, P.E.; Snow, M.G.; Davidson, N.J. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Dec 1980. Contract AC06-77RL01030. 40p. (CONF-801234—2). NTIS, PC A03/MF A01. Order Number DE81024400.

From American geophysical union special session; San Francisco, CA, USA (7 Dec 1980).

Excellent exposures of numerous, well-preserved flows of continental flood tholeiite in south-central Washington provide opportunity to study primary internal structures of subaerial basalt flows. Typical intraflow structures (top to bottom) of a flow include: ropy to brecciated, vesicular flow top; coarsely columnar basalt (upper colonnade); hackly to columnar basalt with relatively small columns (entablature); relatively large, regular columns (lower colonnade); and a glassy basal zone that may be pillowed, vesicular, or highly fractured. One or more of these intraflow struc-

tures may be absent or present in multiples in any given flow. Predominance of certain combinations of intraflow structures define three basic types of flows. Type I flows consist principally of relatively large (> 0.9 m), irregular columns with little or no entablature and a poorly developed flow top. Type II flows exhibit alternating tiers of entablature and colonnade 1 to 5 m thick, which give way upward to a more uniform entablature that commonly contains vesicular layers. Type III flows have sharp entablature-colonnade contacts and typically exhibit an upper colonnade. Petrography of samples from different intraflow structures and flow types shows that entablature invariably has abundant black, tachylitic glass; whereas, colonnade typically has much less abundant, brown, transparent glass. Simple conductive cooling models do not explain sharp contacts between the distinctive textures of entablature and colonnade or textural differences between flow types. These textural differences require either different cooling rates or perhaps different oxygen fugacities across a relatively sharp contact within a flow.

26430 (SAND—81-0856) Thermal conductivity of polyhalite and anhydrite from the site of the proposed waste isolation pilot plant. Moss, M.; Haseman, G.M. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 21p. NTIS, PC A02/MF A01. Order Number DE81024046.

The study of the thermal conductivity of rocksalt and other geologic materials by Sweet and McCreight has been extended to include polyhalite and anhydrite from the WIPP 28 and AEC 7 wells, respectively, located at the site of the proposed Waste Isolation Pilot Plant (WIPP) near Carlsbad, NM. The anhydrite changed to a lighter color upon heating, and exhibited a lower conductivity when measured again. The data were fitted to an expression for thermal conductivity, $\lambda = \lambda_{300}(300/T)/\text{sup } \gamma/$, in which λ_{300} is the cnductivity at 300°K and T the temperature in K. For polyhalite $\lambda_{300} = 1.3$ W/m K, and $\gamma = 0.35$ in the range 300 to 528°K. For fresh anhydrite $\lambda\lambda_{300} = 4.5$ W/m K and $\gamma = 1.15$ in the range 300 to 630°K. A rerun on the same anhydrite sample yielded $\lambda_{300} = 3.5$ W/m K and $\gamma = 1.00$ in the range 300 to 725°K. Another anhydrite sample, heated for 24 h at 723°K, had an even lower conductivity - 2.5 and 2.1 W/m K at 328 and 348°K, respectively. The recommended thermal conductivity parameters for thermal modeling are: polyhalite, $\gamma = 0.35$, $\lambda_{300} = 1.4$ +- 0.2 W/m K; anhydrite, $\gamma = 1.15$, $\lambda_{300} = 4.7$ +- 0.2 W/m K.

26431 Interpretation of a hydraulic fracturing experiment, Monticello, South Carolina. Narasimhan, T.N.; Palen, W.A. (Earth Science Division, Lawrence Berkeley Laboratory). *Geophysical Research Letters ;* **8**: No. 5, 481-484(May 1981).

Pressure transient data from a hydraulic fracturing experiment have been analyzed using a numerical model. Several system parameters and their sensitivities were evaluated, assuming a vertical, penny-shaped fracture geometry. Although the best-fit parameters may not constitute a unique set, they do appear credible from what a current field experience would indicate. It was found that the injection pressure transient is sensitive to initial fracture aperture, fracture stiffness, minimum horizontal stress, rock toughness, and host-rock permeability.

5804 Geochemistry

REFER ALSO TO CITATION(S) 26276

26432 Elemental concentrations in the United States Geological Survey's geochemical exploration reference samples: a review. Gladney, E.S.; Perrin, D.R.; Owens, J.W.; Knab, D. (Los Alamos Scientific Lab., NM). *Analytical Chemistry ;* **51**: No. 9, 1557-1569(Aug 1979).

Silicate standard reference materials have been largely depleted. The function and value of these materials and the adequacy of several certification processes is examined. Concentrations of 42 elements measured at this laboratory are presented along with the available comparative data.

5805 Oceanography

REFER ALSO TO CITATION(S) 26298

64 PHYSICS RESEARCH

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 26546

26433 Large-angular-scale anisotropy in the cosmic background radiation. Gorenstein, M.V.; Smoot, G.F. (Space Sciences Laboratory and Lawrence Berkeley Laboratory, University of California, Berkeley). *Astrophysical Journal ;* **244**: No. 2, 361-381(1 Mar 1981).

We report the results of an extended series of airborne measurements of large-angular-scale anisotropy in the 3 K cosmic background radiation. Observations were carried out with a dual-antenna microwave radiometer operating at 33 GHz (0.89 cm wavelength) flown on board a U-2 aircraft to 20 km altitude. In 11 flights, between 1976 December and 1978 May, the radiometer measured differential intensity between pairs of directions distributed over most of the northern hemisphere. The measurements show clear evidence of anisotropy that is readily interpreted as due to the solar motion relative to the sources of the radiation. The anisotropy is well fitted by a first order spherical harmonic of amplitude 3.6 +- 0.5 mK, corresponding to a velocity of 360 +- 50 km s^{-1} toward the direction 11.2 +- 0.5 hours of right ascension and 19° +- 8° declination. A simultaneous fit to a combined hypothesis of dipole and quadrupole angular distributions places a 1 mK limit on the amplitude of most components of quadrupole anisotropy with 90% confidence. Additional analysis places a 0.5 mK limit on uncorrelated fluctuations (sky-roughness) in the 3 K background on an angular scale of the antenna beam width, about 7°.

26434 Coldest neutron star. Feinberg, G. (Physics Department, Columbia University, New York, New York 10027). *Physical Review [Section] D: Particles and Fields ;* **23**: No. 12, 3075(15 Jun 1981).

If, as is suggested in some theories of subatomic particles, all baryons are unstable against decay into leptons, with lifetimes of about 10^{30} years, then various astronomical objects have minimum surface temperatures. This temperature is about 0.4 °K for a main sequence star, 4 °K for a white dwarf, and 100 °K for a neutron star.

26435 Nonleptonic decays of charmed mesons. Part 1. Remarks on the differing lifetimes of charmed mesons. Rosen, S.P. (Los Alamos Scientific Lab., NM). pp 10p, Paper 9A of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

Differences in the D^+ and D^0 lifetimes may arise either from 6-dominance in the effective nonleptonic Hamiltonian, or from the dominance of a particular W^+-exchange diagram which behaves like a D^0-anti K^0 pole. If 6-dominance holds, then the F^+ will have a relatively short lifetime and a small semi-leptonic branching ratio, just like the D^0, but if W^+-exchange is dominant, the F^+ will have a long lifetime and large semi-leptonic branching ratio, like the D^+.

6402 Atmospheric Physics

REFER ALSO TO CITATION(S) 25294

26436 (DOE/CH/10048—1) Initial assessment of the effects of energetic-ion injections in the magnetosphere due to the transport of satellite-power-system components from low earth orbit to geosynchronous earth orbit. Curtis, S.A.; Grebowsky, J.M. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jul 1980. Contract AI02-80CH10048. 32p. NTIS, PC A03/MF A01. Order Number DE81025761.

Potentially serious environmental effects exist when cargo orbital transfer vehicle (COTV) ion propulsion is used on the scale proposed in the preliminary definition studies of the Satellite Power System. These effects of the large scale injections of ion propulsion exhaust in the plasmasphere and in the outer magnetosphere are shown to be highly model dependent with major differences existing in the predicted effects of two models - the ion cloud model and the ion sheath model. The expected total number density deposition of the propellant Ar^+ in the plasmasphere, the energy spectra of the deposited Ar^+ and time-dependent behavior of the Ar^+ injected into the plasmasphere by a fleet of COTV vehicles differ drastically between the two models. The major environmental effect of the former model is communication disturbance due to plasma density irregularities, in contrast to the spectacular predictions of the latter model which include power line tripping and pipe line corrosion. The ion sheath model is demonstrated to be applicable to the proposed Ar^+ beam physics if the beam is divergent and turbulent whereas the ion cloud model is not a realistic approximation for such a beam because the frozen-field assumption on which it is based is not valid. Finally, it is shown that the environmental effects of ion propulsion may be mitigated by the appropriate adjustment of the beam parameters.

26437 (DOE/ER/10160—4) Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments. Meltz, G.; Rush, C.M.; Violette, E.J. (United Technologies Corp., East Hartford, CT (USA)). 1981. Contract AI01-80ER10160. 72p. NTIS, PC A04/MF A01. Order Number DE81024033.

The microwave power beam from a Solar Power Satellite (SPS) is sufficiently intense to cause large changes in the properties of the lower ionosphere by ohmic heating of the plasma. Power is absorbed from the beam at a rate that is proportional to the ratio of the flux s and the square of an effective frequency f/sub e/. Throughout most of the lower ionosphere f/sub e/ = f^-^+ f/sub L/, where f is the wave frequency and f/sub L is a reduced electron gyrofrequency. It follows that SPS equivalent heating can be simulated at much lower power fluxes with HF radio waves. A detailed examination of the frequency scaling, based on fluid and kinetic theory estimates of the change in electron temperature and density, shows that the high-power HF facility at Platteville, CO, can simulate or exceed the ohmic effects of the SPS beam up to 90 km. This paper describes the results of a series of 5.2 and 9.9 MHz underdense heating experiments undertaken to study the effect of high-power microwaves on the lower ionosphere. A pulsed ionosonde probe, located nearly below the most intense portion of the high-power beam, was used to observe the changes in the D and lower E region. Both phase and amplitude measurements were recorded during CW and intermittent heating.

26438 Optical properties of heavily doped silicon between 1.5 and 4.1 eV. Jellison, G.E. Jr.; Modine, F.A.; White, C.W.; Wood, R.F.; Young, R.T. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review Letters ;* **46**: No. 21, 1414-1417(25 May 1981).

The optical constants of heavily doped silicon are determined between 1.5 and 4.1 eV with use of polarization modulation ellipsometry. For photon energies less than 3.4 eV it is found that there is a substantial increase in the optical absorption coefficient for As-doped silicon, but a much smaller increase for B-doped or P-doped silicon. It is believed that this is due to d-electron admixture into the conduction band when the dopant is As.

26439 Substorm-related plasma sheet motions as determined from differential timing of plasma changes at the Isee satellites. Forbes, T.G.; Hones, E.W. Jr.; Bame, S.J.; Asbridge, J.R.; Paschmann, G.; Sckopke, N.; Russell, C.T. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Journal of Geophysical Research ;* **86**: No. A5, 3459-3469(1 May 1981).

Comparisons of the arrivals and disappearances of plasma sheet electrons observed by the Los Alamos Scientific Laboratory/Max-Planck-Institut analyzers on board the Isee 1 and 2 satellites during the course of a magnetic substorm often show relative time delays between the two satellites on the order of a few seconds. Time decay measurements have been used to determine the motion of the northern plasma sheet boundary during substorms for the period February 5 to May 25, 1978. Near substorm onset the average velocity of the surface of the plasma sheet is 23 +- 18 km/s toward the center of the sheet. And for the same times the average component of the plasma flow based upon moment integrations of the proton distribution is 20 +- 8 km/s in the same direction. During substorm recovery the plasma sheet reappears, its surface moving outward from the center with an average velocity of 133 +- 31 km/s as determined by timing its arrival at the two satellites. However, the corresponding proton flow speed is only 3 +- 7 km/s. At the time of the recovery precursory appearances of the plasma sheet often occur. The time delays associated with these precursors imply that the surface of the plasma sheet moves both upwards and downwards with speeds ~100 km/s. Both the appearance of the precursors and the large difference between the velocity of the plasma sheet surface and the velocity of the flow normal to the surface can be explained by the occurrence of surface waves at the boundary of the plasma sheet which propagate past the satellites at a velocity of 200—600 km/s in the direction of the convective flow. Estimating the tilt of the wave surfaces as +- 15 °, we deduce an average wavelength of 1—5 R/sub E/ and a wave amplitude of ~600—1400 km. Taking into consideration the wave structure at the time of a recovery, we compute a velocity of ~30 km/s for the net outward motion of the plasma sheet boundaries during substorm recovery.

26440 Cameo barium releases : E/sub parallel/ fields over the polar cap. Heppner, J.P.; Miller, M.L.; Pongratz, M.B.; Smith, G.M.; Smith, L.L.; Mende, S.B.; Nath, N.R. (Goddard Space Flight Center, Greenbelt, Maryland 20771). *Journal of Geophysical Research ;* **86**: No. A5, 3519-3542(1 May 1981).

Four successive thermite barium releases at an altidue of 965 km over polar cap invariant latitudes 84 ° to 76 ° near magnetic midnight were conducted from the orbiting second stage of the vehicle that launched Nimus 7. This was the first opportunity to observe the behavior of a conventional barium release when conducted at orbital velocity in the near earth magnetic field and to demonstrate that the μdelB force at orbital velocity would accelerate the Ba^+ ions to much greater altitudes for measuring E/sub parallel/ fields by observing perturbations in the motion of the visible ions. The principal unexpected characteristic in the release dynamics was the high, 1.4 to 2.6 km/s, initial Ba^+ expansion velocity relative to an expected velocity of 0.9 km/s. Characteristics of the neutral gas expansion are also discussed. Under the combined influence of μdelB and E/sub parallel/ forces the finely striated Ba^+ streamers from the 8 kg releases elongated along the field to dimensions>10,000 km and were photographed from California and Hawaii as well as higher latitude sites. Although observed up to one hour after release and to elevation angles<55 ° from Southern California, triangulations of upper tips were limited to the initial 25 min and altitudes<23,000 km. The average E/sub perpendicular/ convection of the Ba^+ flux tubes was very normal for Kp = 3 conditions and closely followed model patterns for convection between the pole and the midnight auroral zone. However, over shorter space-time dimensions the E/sub perpendicular/ field is observed to be irregular; this also is a normal polar cap condition.

26441 Structure of the low-latitude boundary layer. Sckopke, N.; Paschmann, G.; Haerendel, G.; Sonnerup, B.U.O.; Bame, S.J.; Forbes, T.G.; Hones, E.W. Jr.; Russell, C.T. (Max-Planck-Institut fuer Physik und Astrophysik, Institut fuer Extraterrestrische Physik, 8046 Garching, Federal Republic of Germany). *Journal of Geophysical Research ;* **86**: No. A4, 2099-2110(1 Apr 1981).

Observations at high temporal resolution of the frontside magnetopause and plasma boundary layer, made with the Los Alamos Scientific Laboratory/Max-Planck-Institut, Institut fuer Extraterrestrische Physik, fast plasma analyzer on board the Isee 1 and 2 spacecraft, have revealed a complex quasi-periodic structure of some of the observed boundary layers: cool tailward streaming boundary layer plasma is seen intermittently, with intervening periods of hot tenuous plasma which has properties similar to the magnetospheric population. While individual encounters with the boundary layer plasma last only a few minutes, the total observation time may extend over 1 hour or more. One such crossing, at 0800 hours local time and 40° northern GSM latitude, is examined in detail, including a quantitative comparison of the boundary layer entry and exit times of the two spacecraft. The data are found to be compatible with a boundary layer that is always attached to the magnetopause but where the layer thickness has a large-scale spatial modulation pattern which travels tailward past the spacecraft. Included are periods when the thickness is essentially zero and others when it is of the order of 1 R/sub E/. The duration of these periods is highly variable but is typically in the range of 2—5 min, corresponding to a distance along the magnetopause of the order of 3—8 R/sub E/. The observed boundary layer features include a steep density gradient at the magnetopause, with an approximately constant boundary layer plasma density amounting to about 25% of the magnetosheath density, and a second abrupt density decrease at the inner edge of the layer. It also appears that the purely magnetospheric plasma is ocassionally separated from the boundary layer by a halo region in which the plasma density is somewhat higher, and the temperature somewhat lower, than in the magnetosphere. A tentative model is proposed.

26442 Dynamics of energetic electrons in the earth's outer radiation belt during 1968 as observed by the Lawrence Livermore National Laboratory's spectrometer on Ogo 5. West, H.I. Jr.; Buck, R.M.; Davidson, G.T. (Lawrence Livermore National Laboratory, University of California Livermore, California 94550). *Journal of Geophysical Research ;* **86**: No. A4, 2111-2142(1 Apr 1981).

An account is given of measurements of electrons made by the LLNL magnetic electron spectrometer (60—3000 keV in seven differential energy channels) on the Ogo 5 satellite in the earth's outer-belt regions during 1968 and early 1969. The data were analyzed to identify those features dominated by pitch angle and radial diffusion; in doing so all aspects of phase space covered by the data were studied, including pitch angle distributions and spectral features, as well as decay rates. The pitch angle distributions are reported elsewhere. The spectra observed in the weeks after a storm at L~3—4.5 show the evolution of a peak at ~1.5 MeV and pronounced minima at ~0,5 MeV. The observed pitch angle diffusion lifetimes are identified as being the shortest decays observed and are found to be highly energy and L dependent with minimum lifetimes of ~1—2 days occurring at L ~3—4.5. Two contiguous periods of decay, following the intense storm injection on October 31 and November 1, were analyzed in terms of radial diffusion. Significant differences were found between the derived values of D/sub L/L for the two periods; also significant energy dependence shows in the results. Although the values of D/sub L/L vary by about a factor of 10, representative values are 0.3 day^{-1} at L = 6, 0.06 at L = 4, 0.015 at L = 3, and 0.001 at L = 2.5. Despite the wide variation of many prior results in the literature, there is a family of results in approximate agreement with the present results. By noting the variations in D/sub L/L, as a function of the invariant quantities, we are able to order a fair body of previous results with our new results.

26443 Near-equatorial, high-resolution measurements of electron precipitation at L≅6.6. Baker, D.N.; Stauning, P.; Hones, E.W. Jr.; Higbie, P.R.; Belian, R.D. (Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Journal of Geophysical Research ;* **86**: No. A4, 2295-2313(1 Apr 1981).

Previous studies of precipitating electrons at low altitudes in the auroral zone have shown that such precipitation is impulsive and highly fluctuating (time scales of seconds). It is also generally supposed that energetic electron precipitation results from wave-particle scattering that occurs primarly near the outer zone (L = 5—8) equatorial plane. In contrast to prior low-altitude measurements, however, nearly all previously reported measurements made in the near-equatorial regions have been quite slow, with loss cone sampling times of minutes. This paper presents correlated measurements of Technical University of Denmark auroral zone riometer data (20-s sampling times) and Los Alamos Scientific Laboratory high-resolution (8-ms sampling, 10-s rotation) >30-keV electron measurements made at geostationary orbit during the course of magnetospheric substorms. Prior to substorm expansion onset, substantial evidence is found to support the concept of a substorm growth phase. Following the expansion phase onset and the concomitant injection of newly energized electrons into the outer magnetosphere, it is possible to examine equatorial electron fluxes in the loss cone for cases of weak pitch angle diffusion as well as for cases of strong pitch angle diffusion. During strong diffusion events, it is found that precipitating electron fluxes are highly fluctuating and impulsive at the minimum loss cone sampling time of 10 s. For such event periods the pitch angle distribution outside the loss cone is nearly flat (isotropic flux), the absolute electron intensity (>30 keV) is near 'saturation' ($j \sim 5 \times 10^7$ cm^{-2} s^{-1} sr^{-1}), and the 20-MHz conjugate riometer intensity is very high (5—15 dB). These results demonstrate the equatorial wave-particle interactions do not build up steadily and gradually but rather that they develop in an impulsiveor sporadic way.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 25950

26444 (AD-A—089736) Electron and ion flows in diodes. Final report 19 Mar 79-18 Jun 80. Goldstein, S.A.; Ottinger, P.F.; Barker, R.J.; Meger, R.A. (JAYCOR, Alexandria, VA (USA)). 19 Aug 1980. Contract N00014-79-C-0177. 40p. NTIS, PC A03/MF A01.

The three subjects, small size diodes (1 mm) in order to generate very large ion current density, medium size diodes (10 cm) for efficient ion beam generation via the Pinch Reflex Diode, and large diodes (approx. 1 m) were the principle areas investigated and are concentrated on in this report. In particular, this report explains the physics of the backscatter diode and how a runaway phenomenon can generate very large current density ion beams which could be used in beam target studies. There follows an examination of the physics of how anode plasmas are generated using various materials and the question of electron flow in a pinch-reflex diode (PRD). The report ends with a review of the role of electron and ion flows in large area diodes driving plasma loads.

26445 (AD-A—090287) Electronic excitation in molecular collisions: structural, dynamic and kinetic considerations. Annual summary report no. 2, Sep 79-Aug 80. Levine, R.D. (Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry). Sep 1980. 10p. NTIS, PC A02/MF A01.

The factors governing chemical reactivity with special reference to the role of electronic energy in promoting the reaction and to the production of electronically excited species are examined. The problem is studied both in general terms (i.e., the development of the required theoretical framework) and in application to specific systems. (Author)

26446 (AD-A—090528) Theoretical studies relating to the interaction of radiation with matter: atomic collision processes occurring in the presence of radiation fields. Annual report No. 3, 1 Aug 79-31 Jul 80. (New York Univ., NY (USA). Dept. of Physics). 1 Oct 1980. Contract N00014-77-C-0553. 153p. NTIS PC MF A01.

Work is reported in the areas of:- (1) Collisionally-Aided Radiative Excitation; (2) Model Potential Calculations in Atom-Field-Radiation Systems; (3) Coherence Effects in Radiative Collisions; (4) Two-Level Atom and Radiation Pulse; (5) Resonance Fluorescence in Three-Level Systems; (6) Modulation Spectroscopy; and (7) Effects of Collisions on Atomic Coherences. (Author)

26447 (CONF-800626—8) Photoionization of atomic iodine and atomic tellurium. Berkowitz, J.; Batson, C.H.; Goodman, G.L. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 4p. NTIS, PC A02/MF A01. Order Number DE81023546.

From 6. international conference on vacuum ultraviolet radiation physics; Charlottesville, VA, USA (2 Jun 1980).

The photoionization yield curve is presented for atomic iodine from 645 A to the ionization threshold, made using a thermal atomic beam source and photoionization mass spectrometry. This information is also presented for tellurium from 670 A to the ionization threshold.

26448 (CONF-800726—2) Quadratically convergent MCSCF theory for large-configuration sets. Das, G. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 4p. NTIS, PC A02/MF A01. Order Number DE81023539.

From MCHF workshop; College Station, TX, USA (14 Jul 1980).

Portions of document are illegible.

A multi-configuration self-consistent field method for large configuration-sets is presented. It consists in identifying a primary subset containing the predominant configurations and a secondary one containing the rest. The formalism achieves near-quadratic convergence as well as a significant simplification of the orbital-transformation problem by the introduction of Fock equations and Fock matrices.

26449 (CONF-801111—49) Foil dissociation of fast molecular ions into atomic excited states. Berry, H.G.; Gay, T.J.; Brooks, R.L. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023805.

From 6. conference on application of accelerators in research and industry; Denton, TX, USA (Nov 1980).

The intensity and polarizations of light emitted from atomic excited states of dissociated molecular ions were measured. The dissociations are induced when fast molecular ions (50 to 500 keV/amu) are transmitted through thin carbon foils. A calculation of multiple scattering and the Coulomb explosion gives the average internuclear separation of the projectile at the foil surface. Experimentally, the foil thickness is varied to give varying internuclear separations at the foil surface and observe the consequent variation in light yield and optical polarization. Using HeH^+ projectiles, factors of 1 to 5 enhancements of the light yields from n = 3, ^{1,3}P,D states of He I and some He II and H I emissions were observed. The results can be explained in terms of molecular level crossings which provide mixings of the various final states during dissociation of the molecular ions at the exit surface. They suggest a short range surface interaction of the electron pick-up followed by a slow molecular dissociation. Alignment measurements confirm the essential features of the model. Observations of Lyman α emission after dissociation of H_3^+ amd H_5^+ show rapid variations in light yield for small internuclear separations at the foil surface.

26450 (CONF-8004161—1) Electron spectra and structure of atomic and molecular clusters. Dehmer, P.M. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023544.

From Physics and chemistry of energy-related atmospheric pollution; Harpers Ferry, WV, USA (21 Apr 1980).

Changes in electronic structure that occur during the stepwise transition from gas phase monomers to large clusters which resemble the condensed phase were studied. This basic information on weakly bound clusters is critical to the understanding of such phenomena as nucleation, aerosol formation, catalysis, and gas-to-particle conversion, yet there exist almost no experimental data on neutral particle energy levels or binding energies as a function of cluster size. (GHT)

26451 (CONF-8106100—1) Resonance ionization spectroscopy: counting noble-gas atoms. Hurst, G.S.; Payne, M.G.; Chen, C.H.; Willis, R.D.; Lehmann, B.E.; Kramer, S.D. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01. Order Number DE81024252.

From International conference on laser spectroscopy; Alberta, Canada (29 Jun 1981).

New work on the counting of noble gas atoms, using lasers for the selective ionization and detectors for counting individual particles (electrons or positive ions) is reported. When positive ions are counted, various kinds of mass analyzers (magnetic, quadrupole, or time-of-flight) can be incorporated to provide A selectivity. It is shown that a variety of interesting and important applications can be made with atom-counting techniques which are both atomic number (Z) and mass number (A) selective.

26452 (DOE/ER/10612—3) $^{12}C/^{13}C$ and H/D vapor pressure isotope effects of fluoroform: intermolecular interactions in liquid fluoroform. Popowicz, A.M. (State Univ. of New York, Stony Brook (USA)). 1 Jun 1981. Contract AC02-80ER10612. 251p. NTIS, PC A12/MF A01. Order Number DE81024422.

Thesis.

A precision cryostat of the Bigeleisen-Brooks-Ribnikar-Ishida (BBIR) type with associated vacuum systems has been constructed and the appropriate temperature/pressure measurement and control systems designed and implemented. Various improvements in the cryostat design were incorporated in order to facilitate the assembly and repair processes. A major design change involved the incorporation of a digital stand alone computer to control cryostat operations. This apparatus was used to measure the $^{12}C/^{13}C$ and H/D Vapor Pressure Isotope Effects of Fluoroform. Analysis of the measured VPIE results, in light of existing experimental data and theories, has demonstrated the need of a temperature dependent liquid force field, specifically a temperature-dependent interaction force constant between the C-H stretching motion and translational motion in the direction of the figure axis of CHF_3. This result is consistent with the observed spectroscopic data and vibrational and configurational models of fluoroform dimers. The intermolecular interaction is believed to be a weak hydrogen-bond in nature.

26453 (DOE/ET/33066—2) Generation and identification of UIII lines. Annual report. Schneider, R.T.; Carter, B.D.; Roxey, T.E. (Florida Univ., Gainesville (USA). Dept. of Nuclear Engineering Sciences). Apr 1981. Contract AS05-80ET33066. 159p. NTIS, PC A08/MF A01. Order Number DE81024438.

During the first year of this contract, a facility capable of generating a uranium plasma has been constructed and tested and a number of UIII lines have been detected and identified. The facility is a vortex stabilized dc arc operated at currents up to 140 amperes. The anode is uranium and the gas providing the stabilization is helium. By proper manipulation of current and gas flow (constriction) the temperature of the arc can be varied over a limited range. The spectrum obtained displays UI, UII, and UIII lines. No helium lines are observed, and no other impurities have been found to date. Detailed analysis of the spectra obtained covers to date the wavelength range from 5070A to 5802A. They consist of 87 UI, 69 UII, and 4 UIII lines. The UIII lines measured wavelengths agree well with the literature values for these lines. There are also 9 additional lines which have been tentatively identified as UIII lines but are not listed in the literature. More measurements need to be taken before a firm identification of these lines can be made. A semi-automatic line identification system using an Amdahl 470 computer was developed. This system uses a 5th order least squares curve fitting routine to find the dispersion curve from known lines.

26454 (LBL—12454) H^- and D^- production by backscattering from surfaces. Berkner, K.H.; Ehlers, K.W.; Graham, W.G.; Leung, K.N.; Pyle, R.V.; Schneider, P.J.; Stearns, J.W. (Lawrence Berkeley Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 38p. (CONF-810442—3). NTIS, PC A03/MF A01. Order Number DE81023025.

From Joint workshop on negative ions; Mexico City, Mexico (1 Apr 1981).

Three experiments are described in which H^- or D^- ions have been produced by backscattering from surfaces coated with alkali metals: (1) Backscattering of H^- and D^- produced by 0.15- to 4-keV/nucleus H_2^+, H_3^+, D_2^+, and D_3^+ bombarding clean targets of Cs, Rb, K, Na, and Li. For each target, the H^- and D^- yields were maximized at incident energies between 300 and 1200 eV/nucleus and always at a lower incident energy for H than for D on a given target. At any given incident energy, both the H^- and D^- yields decreased in going from Cs to Li in the order given above. (2) A Mo surface was bombarded by a low-energy flux of H atoms produced in a tungsten furnace. As the surface work function was reduced by evaporating Cs onto the target, a small fraction (10^{-9}) of the incident hydrogen atoms was observed as backscattered H^- ions. (3) Surfaces of Mo, W, Pt, Ni, Cu, Re, Ta, and Pd were bombarded by hydrogen ions produced in a discharge. Two classes of H^- ions were observed when Cs was added to the discharge - H^- ions leaving the surface with approximately $<$ 10 eV and H^- ions leaving the surface with approximately 50 to 100 eV.

26455 Calculation of the 3p-3d transitions in muonic helium. Borie, E. (Karlsruhe Univ. (TH) (Germany, F.R.). Inst. fuer Theoretische Kernphysik); Rinker, G.A. (Los Alamos Scientific Lab., NM (USA)). *Zeitschrift fuer Physik [Section] A: Atoms and Nuclei ;* **296**: No. 2, 111-112(1980).

The energy splittings of the 3p and 3d states of muonic helium have been calculated. The theoretically predicted transition energies should be useful in connection with a proposed laser resonance experiment.

26456 Hyperfine and spin—rotational structure of CaBr X ^2u (v = 0) by molecular-beam laser-rf double resonance. Childs, W.J.; Cok, D.R.; Goodman, G.L.; Goodman, L.S. (Argonne National Laboratory, Argonne, Illinois 60439). W-31-100-ENG-38. *Journal of Chemical Physics, The ;* **75**: No. 2, 501-507(15 Jul 1981).

The molecular-beam, laser—rf, double-resonance technique has been used to make high-precision measurements of the spin—rotation and hyperfine interactions in the X $^2\Sigma$ (v = 0) electronic ground state of $Ca^{79}Br$ and $Ca^{81}Br$. The spin—rotation interaction is found to have a strong N dependence. The Frosch—Foley magnetic hyperfine parameters b and c and the electric—quadrupole hfs parameter eqQ are determined for both molecules.

26457 Luminescence characteristics of 3-hydroxyflavone as a function of pressure and viscosity. Salman, O.A.; Drickamer, H.G. (School of Chemical Sciences and Materials Research Laboratory, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801). *Journal of Chemical Physics, The ;* **75**: No. 2, 572-576(15 Jul 1981).

The effect of pressure on the emission of 3-hydroxyflavone has been studied in isobutanol, glycerol, and two mixtures of these solvents. Below a viscosity of ~50 P there is an increase in the fraction of emission from the tautomeric state with pressure. At higher viscosities the fraction of tautomeric emission decreased. At viscosities less than ~50 P the lifetimes obtained from the two emission peaks were the same, indicating that the two excited states were in equilibrium. At higher viscosities, the lifetimes differed, indicating that the distribution was kinetically controlled. In hexamethylnonane (HMN) only tautomer emission was observed even at very high viscosities; also, only tautomer emission occurs in a rigid polyisobutylene film. A few measurements on 7-hydroxyflavone are briefly discussed.

26458 Shape resonance effects in the photoabsorption spectra of BF_3. Swanson, J.R.; Dill, D.; Dehmer, J.L. (Department of Chemistry, Boston University, Boston, Massachusetts 02215). *Journal of Chemical Physics, The ;* **75**: No. 2, 619-624(15 Jul 1981).

Multiple-scattering model calculations of cross sections for dipole transitions from all occupied orbitals of BF_3 to excited bound states and continuum states of electron kinetic energy $<$30 eV are presented. The photoelectron angular distribution asymmetry parameters β are also given for all occupied orbitals. The boron and fluorine K-shell calculations are in qualitative agreement with, and provide a clear interpretation of, the measured spectra. Two shape resonances are found in the low energy continuum: one of a/ sup prime/$_1$ symmetry, the other of e' symmetry. The resonances are found to be due to trapping of p waves on the fluorine atoms. This atomic localization as well as the dominance of low-l partial waves outside the molecule put these shape resonances in a class distinct from those observed in diatomic molecules.

26459 Analysis of the Auger spectra of CO and CO_2 . Kelber, J.A.; Jennison, D.R.; Rye, R.R. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Journal of Chemical Physics, The ;* **75**: No. 2, 652-662(15 Jul 1981).

The electron-excited gas phase carbon and oxygen Auger spectra of CO and CO_2 are compared to the spectra calculated by a one-electron theory. Calculated Auger transition intensities and energies are generally in good agreement with experiment. The disagreement between certain calculated intensities and experiment, however, illustrates those cases where configuration interaction can be expected to provide significant corrections to the one-electron theoretical results. In addition, a comparison of calculated to experimental final state binding energies reveals the existence, in covalent molecules, of localized two-hole final states in which two holes are always on the same site. A simple two-electron theory predicts where such states will occur in the Auger spectra of homonuclear diatomic molecules.

26460 Interaction potentials for Br(^{2}P)+Ar, Kr, and Xe (^{1}S) by the crossed molecular beams method. Casavecchia, P.; He, G.; Sparks, R.K.; Lee, Y.T. (Materials and Molecular Research Division of the Lawrence Berkeley Laboratory). *Journal of Chemical Physics, The ;* **75**: No. 2, 710-721(15 Jul 1981).

Angular distributions of Br(^{2}P/sub 3/2,1/2/) scattered off Ar, Kr, and Xe ($^1S_0$) in the thermal energy range were measured in crossed molecular beams experiments. Interaction potentials for the X1/2 and I3/2 states are derived by using an approximate elastic scattering analysis, which neglects interstate coupling, as previously done for F—Xe, Kr, Ar, Ne and Cl—Xe. While the Br—Xe X1/2 potential (ϵ = 0.645 kcal/mole, r/sub m/ = 3.80 A) shows a stronger interaction than the interaction potential of Kr—Xe, the Br—Kr (ϵ = 0.460 kcal/mole, r/sub m/ = 3.90 A) and Br—Ar (ϵ = 0.380 kcal/mole, r/sub m/ = 3.73 A) X1/2 potentials are closer to those of the corresponding rare gas pairs. The I3/2 potential for all three systems is found to have a shallower ϵ, a slightly larger r/ sub m/, and a more repulsive wall than the $^1\Sigma^+$ potential of the corresponding rare gas pair. The origin of these interactions is discussed and an attempt to examine the rare gas halides ground state bonding is presented.

26461 Factorization relations and consistency conditions in the sudden approximation. Chan, C.; Evans, J.W.; Hoffman, D.K. (Ames Laboratory and Department of Chemistry, Iowa State University, Ames, Iowa 50011). *Journal of Chemical Physics, The ;* **75**: No. 2, 722-737(15 Jul 1981).

Linear factorization relations are derived for the matrix elements of quantum mechanical operators defined on some space H = H_1direct-sumx_2 which are diagonalizable on H_1. The coefficients in these relationships do not depend on the operators per se but do depend on the representations in which the operators are diagonal. The formulation is very general with regard to the nature of the "input" information in the factorization. With each choice of input information there are associated consistency conditions. The consistency conditions, in turn, give rise to a flexibility in the form of the factorization relations. These relations are examined in detail for the operators of scattering theory which are local in the internal molecular coordinates. In particular, this includes S and T matrices in the energy sudden (ES) approximation. A similar development is given for the square of the magnitude of operator matrix elements appropriately averaged over "symmetry classes." In the ES these relations apply to transition cross sections between symmetry

classes. In particular, they apply to degeneracy averaged cross sections in situations where the symmetry classes correspond to energy levels.

26462 Atoms in molecules approach to density functional theory. Guse, M.P. (Monsanto Research Corporation, Mound Facility,)/sup a/ Miamisburg, Ohio 45342). DE-AC04-76-DP00053. *Journal of Chemical Physics, The ;* **75**: No. 2, 828-833(15 Jul 1981).

The concept of an atom in a molecule is developed in the context of density functional theory and used to separate the energy of a molecule into intra-atomic and interatomic terms. The intra-atomic kinetic energy may then be calculated accurately in terms of one-electron orbitals while the interaction term is approximated by an explicit functional of the density. This formalism is applied to the molecules H_3^+ and H_2 where it yields a self-consistent picture of a hydrogen atom in a molecule.

26463 Direct calculation of resonance energies and widths using an R-matrix approach. Schneider, B.I. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Physical Review [Section] A: General Physics ;* **24**: No. 1, 1-3(Jul 1981).

A modified R-matrix technique is presented which determines the eigenvalues and widths of resonant states by the direct diagonalization of a complex, non-Hermitian matrix. The method utilizes only real basis sets and requires a minimum of complex arithmetic. The method is applied to two problems, a set of coupled square wells and the Pi/sub g/ resonance of N_2 in the static-exchange approximation. The results of the calculation are in good agreement with other methods and converge very quickly with basis-set size.

26464 Diabatic-state treatment of negative-meson moderation and capture. I. The hydrogen atom. Cohen, J.S.; Martin, R.L.; Wadt, W.R. (Theoretical Division, Los Alamos National Laboratory, University of California, Los Alamos, New Mexico 87545). *Physical Review [Section] A: General Physics ;* **24**: No. 1, 33-43(Jul 1981).

A new formulation of the moderation and capture of negative mesons by atoms has been developed. The scattering is described by a complex potential with a real part given by a diabatic interaction potential and an imaginary part given by the ionization width of the diabatic state embedded in the electronic continuum. Results are presented for collisions of μ^-, π^-, K^-, and p^- with the hydrogen atom. The differential energy-loss cross sections and stopping powers obtained are large. The energy spectrum of stopped mesons is determined and most captures are found to occur at collision energies below or near the ionization potential. The principal—quantum-number distributions of the initially formed mesic atoms peak close to the orbital giving optimal overlap with the displaced electronic orbital. The angular-momentum distributions are not too different from statistical, except that they tend to cut off at l significantly smaller than n-1 in the case of large n. Comparison to a very recent experiment is made in a note added.

26465 Doubly differential cross sections of secondary electrons ejected from gases by electron impact: 25 —250 eV on H_2. Shyn, T.W.; Sharp, W.E.; Kim, Y. (Space Physics Research Laboratory, University of Michigan, Ann Arbor, Michigan 48109). *Physical Review [Section] A: General Physics ;* **24**: No. 1, 79-88(Jul 1981).

Doubly differential cross sections of secondary electrons ejected from H_2 by electron impact have been measured by a crossed-beam method. The incident energies used were 25, 40, 60, 100, 150, and 250 eV. The energy and angular range of secondary electrons measured were from one half of the difference between incident energy and ionization potential to 1.0 eV and from 12° to 156°, respectively. The present results do not agree with those of DuBois and Rudd for slow secondary electrons (<20 eV) ejected by 100-eV primary electrons. The present data lead to total ionization cross sections within 10% of other measurements.

26466 Theory of positron production in heavy-ion collisions. Reinhardt, J.; Mueller, B.; Greiner, W. (Institut fuer Theoretische Physik, Johann Wolfgang Goethe Universitaet, 6000 Frankfurt am Main, West Germany). *Physical Review [Section] A: General Physics ;* **24**: No. 1, 103-128(Jul 1981).

Collisions of very heavy ions at energies close to the Coulomb barrier are discussed as a unique tool to study the behavior of the electron-positron field in the presence of strong external electromagnetic fields. To calculate the excitation processes induced by the collision dynamics, a semiclassical model is employed and adapted to describe the field-theoretical many-particle system. An expansion in the adiabatic molecular basis is chosen. Energies and matrix elements are calculated using the monopole approximation. In a supercritical ($Z_1+Z_2>$ or ≈ 173) quasiatomic system the 1s level joins the antiparticle continuum and becomes a resonance, rendering the neutral vacuum state unstable. Several methods of treating the corresponding time-dependent problem are discussed. A projection-operator technique is introduced for a fully dynamical treatment of the resonance. Positron excitation rates in s/sub 1/2/ and p/sub 1/2/ states are obtained by numerical solution of the coupled-channel equations and are compared with results from first- plus second-order perturbation theory. Calculations are performed for subcritical and supercritical collisions of Pb-Pb, Pb-U, U-U, and U-Cf. Strong relativistic deformations of the wave functions and the growing contributions from inner-shell bound states lead to a very steep Z dependence of positron production. The results are compared with available data from experiments done at GSI. Correlations between electrons and positrons are briefly discussed.

26467 Photoionization of atomic iodine and atomic tellurium. Berkowitz, J.; Batson, C.H.; Goodman, G.L. (Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). W-31-109-ENG-38. *Physical Review [Section] A: General Physics ;* **24**: No. 1, 149-160(Jul 1981).

Mass-analyzed photoionization spectra have been obtained from beams of atomic iodine and atomic tellurium from their respective ionization thresholds to ~19 eV. In each instance, the ionization thresholds are confirmed. For iodine, most of the features in the autoionization resonance spectrum have been identified and assigned to several s- and d-like Rydberg series converging to the higher-ionization limits $^3P_0$, $^3P_1$, $^1D_2$, and $^1S_0$ of the $5s^25p^4$ configuration. For tellurium we also observe autoionization resonance features assigned to s- and d-like Rydberg series converging to the higher-ionization limits ^{2}D/sub 3/2/, ^{2}D/sub 5/2/, ^{2}P/sub 1/2/, and ^{2}P/sub 3/2/ of the $5s^25p^3$ configuration. In addition, a window-resonance series and additional peaks have been assigned as converging to the $5s5p^4$ ^{4}P/sub 5/2/ state of Te^+, with quantum defect of ~0.5 (modulo 1). In both elements, the d-like series exhibits anomalous resonance profiles similar to those in the heavier noble gases, with quantum defects of ~0.4 (modulo 1). The s-like series has quantum defects of ~0.0 (modulo 1). Some comparisons are made with many-body calculations on the related chlorine atom.

26468 Oscillator strength for principal series transitions to the high Rydberg states of potassium. Huang, C.; Wang, C.C. (Institute of Physics, Chinese Academy of Sciences, Beijing (Peking), People's Republic of China). *Physical Review Letters ;* **46**: No. 18, 1195-1198(4 May 1981).

This Letter reports accurate values for the oscillator strength of potassium, and possible resolution of some outstanding discrepancies concerning the oscillator strengths and photoionization cross sections of this atom. Our results establish a value of (5.2 +- 0.5) x 10^{-21} cm^2 for the photoionization cross section at the series limit.

26469 Spatial resolution for two-beam spectroscopy: a new mechanism. Billard, B.D. (University of California, Lawrence Berkeley Laboratory, Berkeley, California 94720). W-7405-ENG-48. *Applied Optics ;* **20**: No. 9, 1668-1675(1 May 1981).

With the help of interference effects, two-beam and multiple-beam spectroscopy detect in the pairs of beams (bundles of rays selected by optical system) phase correlations due to certain fluctu-

ations in optically thin distributions of incoherent light sources. Originally spatial resolution along the line of sight was expected for multiple-beam spectroscopy because of the limited region of intersection for pairs of beams. Here more general analysis shows another mechanism of spatial resolution allowing use of broader overlapping beams. Thus a simpler two-beam spectroscopy configuration (to be discussed in more detail elsewhere) capable of making more efficient use of emitted light proves to offer the same localized measurement of spatially harmonic fluctuations in the appropriate light source distribution.

26470 Negative hydrogen ion production in a cw plasma source. Vaucher, B.G.; Ehlers, K.W. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Helvetica Physica Acta ;* **53**: No. 2, 285(30 Nov 1980).

From Spring meeting of the Swiss Physical Society; Zuerich, Switzerland (10 - 11 Apr 1980).

26471 Dielectric constant of atomic fluids with variable polarizability. Alder, B.J. (Lawrence Livermore Lab., CA); Beers, J.C. II, Strauss, H.L.; Weis, J.J. *Proceedings of the National Academy of Sciences of the United States of America ;* **77**: No. 6, 3098-3102(Jun 1980).

The Clausius-Mossotti function for the dielectric constant is expanded in terms of single atom and pair polarizabilities, leading to contributions that depend on both the trace and the anisotropy of the pair-polarizability tensor. The short-range contribution of the anisotropic part to the pair polarizabilities has previously been obtained empirically from light scattering experiments, whereas the trace contribution is now empirically determined by comparison to dielectric experiments. For helium, the short-range trace part agrees well with electronic structure calculations, whereas for argon qualitative agreement is achieved.

26472 Radiation from silver films bombarded by low-energy electrons. Chung, M.S.; Callcott, T.A.; Kretschmann, E.; Arakawa, E.T. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Surface Science ;* **91**: 245-263(1980).

Emission spectra from Ag films irradiated by low energy electrons (20 to 1500 eV) have been measured, and the results compared with theory. For relatively smooth films, two peaks in the spectra are resolved. One at 3.73 eV, the volume plasmon energy, is attributed to transition radiation and/or bremsstrahlung. The second, at about 3.60 eV, is very sensitive to surface roughness in both position and magnitude and is produced by roughness-coupled radiation from surface plasmons. For rough films, the roughness-coupled radiation dominates the emission. In addition to spectral shapes, the polarization of the radiation and its intensity as a function of electron energy were measured. The experimental results are compared with new calculations of roughness-coupled emission which account for most of our observations. They indicate that high wavevector roughness components play the dominant role in the emission process. 37 references.

26473 Critical analysis of theoretical models for the giant Raman effect from adsorbed molecules. Furtak, T.E.; Reyes, J. (Ames Lab., IA). Contract W-7405-ENG-82. *Surface Science ;* **93**: 351-382(1980).

Several theoretical models which have recently been proposed in an attempt to explain the anomalously high Raman intensity from molecules adsorbed onto metal surfaces are analyzed. The theories are classified according to their primary mechanism, pointing out similarities and differences, some which have not previously been recognized in print. A critical analysis of the conceptual basis is presented, and an outline of the experimental implications of each theory is given. It is concluded that several theories have serious problems in their associated assumptions, and that other theories have been brought into question by recent experimental results. Additional experiments which would help clarify the situation are proposed. 67 references.

26474 Interaction between a He atom and a graphite surface. Carlos, W.E.; Cole, M.W. (Pennsylvania State Univ., University Park). Contract AC02-79ER10454. *Surface Science ;* **91**: 339-357(1980).

A study is presented of the interaction V(r) between a He atom and a graphite surface. V(r) is assumed equal to a sum of pair interactions U(r-R/sub i/) between the He and C atoms. None of a set of isotropic potentials (dependent only on the magnitude absolute value r-R/sub i) is consistent with recent scattering data. Anisotropic pair potentials, in contrast, are found to yield good agreement. The origin of this anisotropy is analyzed in terms of the graphite dielectric function and charge density. 58 references.

6404 Fluid Physics

26475 (LBL—10909) Computer program CCC: user's manual. Mangold, D.C.; Lippmann, M.J.; Bodvarsson, G.S. (Lawrence Berkeley Lab., CA (USA)). Jan 1980. Contract W-7405-ENG-48. 60p. NTIS, PC A04/MF A01. Order Number DE81025116.

The Numerical Model CCC (conduction-convection-consolidation), developed at the Lawrence Berkeley Laboratory, solves numerically the heat and mass flow equations for a liquid saturated medium, and computes one-dimensional consolidation of the simulated systems. The model employs the Integrated Finite Difference Method (IFDM) in discretizing the saturated medium and in formulating the governing equations. The sets of equations are solved by an iterative solution technique. The deformation of the medium is calculated using the one-dimensional consolidation theory of Terzaghi.

26476 Force on a moving plasma by a finite conductivity wall. Boozer, A.H. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). DE-AC02-76-CH03073. *Physics of Fluids ;* **24**: No. 7, 1387-1389(Jul 1981).

The force on a plasma which is moving relative to a finite conductivity wall is evaluated assuming that the plasma is distorted by a saturated magnetohydrodynamic mode.

26477 Transverse normal modes of finite vortex arrays. Campbell, L.J. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Physical Review* [*Section*] *A: General Physics ;* **24**: No. 1, 514-534(Jul 1981).

The normal modes of stationary vortex patterns in two dimensions are studied for arbitrary dissipation in both the unbounded and circle-bounded cases. All eigenvectors are given for the ground-state patterns of N = 2 through 12 vortices and N = 19; all frequencies are given for N = 2 through 20. The complete eigenfrequency spectrum of single-ring patterns is given for all N. The integrals of unbounded motion are generalized to include dissipation. It is shown that angular momentum is strictly confined to the breathing mode of all unbounded patterns and of all bounded, single-ring patterns. Comparisons are made with infinite-vortex lattice modes, with a continuum model, and with earlier predictions of pattern stability and mode frequencies.

26478 Statistical mechanics of kinks and central peak phenomena in phi^4 theory for T< or =T/sub c/. Hammer, C.L.; Shrauner, J.E.; De Facio, B. (Department of Physics, Ames Laboratory, Department of Energy, Iowa State University, Ames, Iowa 50011). W-7405-ENG-82. *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 11, 5890-5903(1 Jun 1981).

The statistical mechanics of a system of kinks condensed from a phi^4 field theory in one space and one time dimension is studied with a functional-path-integral formulation of field theory in a coherent-state basis. The kink-kink and phonon-phonon parts of the two-point correlation function and the dynamical structure function are calculated in lowest order. All the qualitative features of the usual free-kink-gas phenomenology are recapitulated in lowest order and quantitative values of the thermodynamic observables agree better with the molecular-dynamics computer-simulation results. The free energy of the kink gas is lower than previously calculated values. Our analysis leads to a double-peak feature in the dynamical structure function as is characteristic of a relativistic boson gas and which agrees with the results of the computer-simulation studies. Our calculation of the dynamical structure function applies for temperatures below a transition temperature T/sub c/ which is defined as that temperature at which the kink velocity vanishes. The numerical values that we calculate for T/sub c/ are somewhat larger than those obtained from computer-simulation

studies but they agree well with the results of Hartree calculations. Below T/sub c/ the temperature dependence of the soft-mode frequency is $\omega = q[1-(T/T/\text{sub c})^2]/\text{sup } 1/2/$ in reasonable agreement with observations on $SrTiO_3$. We emphasize that the path integral is dominated by the whole class of all classical configurations which extremize the classical action and satisfy classical periodic boundary conditions, both spatial and thermal. Boundary conditions are essential in our formulation and these lead to a new statistical mechanics for the condensate (kinks) and the fluctuations (phonons).

26479 Stationary convection in dilute solutions of ^{3}He in superfluid ^{4}He. Warkentin, P.A. (Univ. of California, San Diego, La Jolla); Haucke, H.J.; Lucas, P.; Wheatley, J.C. Contract AS03-76SF00034. *Proceedings of the National Academy of Sciences of the United States of America ;* **77**: No. 12, 6983-6987(Dec 1980).

Two symmetric, convecting steady states have been observed in a novel cell of unity aspect ratio and studied over a range of temperature for two concentrations of ^{3}He in superfluid ^{4}He. An existing theory due to Parshin has been related to the conditions necessary for convection in this system, defining a Rayleigh number closely analogous to that of a classical one-component Benard system. Values of this Rayleigh number at the onset of convection calculated from experimental data are found to have little temperature dependence, with an average value near that for a classical one-component fluid in this geometry. The Prandtl number is small and temperature dependent, with a smallest calculated value of 0.05.

26480 Phase equilibria for highly unsymmetrical plasmas and electrolytes. Pitzer, K.S. (Lawrence Berkeley Lab., CA). Contract W-7405-ENG-48. *Proceedings of the National Academy of Sciences of the United States of America ;* **77**: No. 6, 3103-3104(Jun 1980).

The conclusion of classical Debye-Hueckel theory that a phase separation may occur in highly unsymmetrical plasmas or electrolytes is shown to be false and to arise from a serious error in the treatment of the interaction of pairs of the most highly charged ions. After an approximate correction for this error, no phase separation is predicted. Specific application to iron in the solar plasmas is discussed.

6450 High Energy Physics

26481 Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979). 583p. (CONF-7910103—).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

Abstracts of individual items from the workshop were prepared separately for the data base. (GHT)

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 26086, 26576

26482 (DOE/ER/03072—120) Charmed-meson production in 200-GeV/c pion-beryllium interactions. Sherman, S.S. (Princeton Univ., NJ (USA). Elementary Particles Lab.). 1980. Contract AC02-76ER03072. 113p. NTIS, PC A06/MF A01. Order Number DE81024424.

Thesis.

A three arm spectrometer with narrow acceptance and excellent particle identification was used to search for charged D* meson production at $\sqrt{s}$ = 19.4 GeV. The small 5.7 MeV Q value for the two body decay $D^* \rightarrow D\ PI$ was used as an effective background cut. A 3.0 sigma peak containing 82 +- 25 events is seen in both the Q value and K-PI invariant mass distributions. This corresponds to $d\sigma/dy/\text{sub } y = o/ = 1.4$ +- .6 (statistical) .6 (systematic) μb/(unit rapidity), with assumptions made about the production model.

26483 Shadowing in muon-nucleus scattering. Miller, M.; Moskowitz, B.; LeBritton, J.; McCal, D.; Metcalf, W.; Melissinos, A.C.; Alspector, J.; Borenstein, S.; Kalbfleisch, G.R.; Sharanguivel, J.; Strand, R.C.; Abashian, A. (Department of Physics and Astronomy, University of Rochester, Rochester, New York 14627). *Physical Review* [*Section*] *D: Particles and Fields ;* **24**: No. 1, 1-6(1 Jul 1981).

We have measured the A dependence of muon-nucleus scattering at an incident energy of 10.5 GeV and for $0.2<Q^2<2.4$ $(GeV/c)^2$, $1<\nu<9$ GeV. We observe shadowing over the entire region of Q^2, in disagreement with previous measurements. Current theoretical models predict shadowing only for $Q^2 <$ or ≈ 1 $(GeV/c)^2$.

26484 High-statistics study of πi p, π^-p, and pp elastic scattering at 200 GeV/c. Schiz, A.; Fajardo, L.A.; Majka, R.; Marx, J.N.; Nemethy, P.; Rosselet, L.; Sandweiss, J.; Slaughter, A.J.; Ankenbrandt, C.; Atac, M.; Brown, R.; Ecklund, S.; Gollon, P.J.; Lach, J.; MacLachlan, J.; Roberts, A.; Shen, G. (Yale University, New Haven, Connecticut 06520). *Physical Review* [*Section*] *D: Particles and Fields ;* **24**: No. 1, 26-45(1 Jul 1981).

We have measured π^+p, π^-p, and pp elastic scattering at an incident-beam momentum of 200 GeV/c in the region of -t, four-momentum transfer squared, from 0.021 to 0.665 $(GeV/c)^2$. The data allow an investigation of the t dependence of the logarithmic forward slope parameter bequivalent(d/dt)(ln $d\sigma/dt$). In addition to standard parametrizations, we use functional forms suggested by the additive quark model to fit the measured $d\sigma/dt$ distributions. Within the context of this model we estimate the size of the clothed quark in the pion and proton. Limits on the elastic-scattering amplitude derived from unitarity bounds are checked, and no violations are observed.

26485 Real part of the forward elastic nuclear amplitude for pp, p-barp, πi p, π^-p, K^+p, and K^-p scattering between 70 and 200 GeV/c. Fajardo, L.A.; Majka, R.; Marx, J.N.; Nemethy, P.; Rosselet, L.; Sandweiss, J.; Schiz, A.; Slaughter, A.J.; Ankenbrandt, C.; Atac, M.; Brown, R.; Ecklund, S.; Gollon, P.J.; Lach, J.; MacLachlan, J.; Roberts, A.; Shen, G. (Yale University, New Haven, Connecticut 06520). *Physical Review* [*Section*] *D: Particles and Fields ;* **24**: No. 1, 46-65(1 Jul 1981).

We have measured the elastic cross section for pp, p-barp, π^+p, π^-p, K^+p, and K^-p scattering at incident momenta of 70, 100, 125, 150, 175, and 200 GeV/c. The range of the four-momentum transfer squared t varied with the beam momentum from $0.0016<$ or $=-t<$ or $=0.36$ $(GeV/c)^2$ at 200 GeV/c to $0.0018<$ or $=-t<$ or $=0.0625$ $(GeV/c)^2$ at 70 GeV/c. The conventional parametrization of the t dependence of the nuclear amplitude by a simple exponential in t was found to be inadequate. An excellent fit to the data was obtained by a parametrization motivated by the additive quark model. Using this parametrization we determined the ratio of the real to the imaginary part of the nuclear amplitude by the Coulomb-interference method.

26486 Measurements of the properties of D-meson decays. Schindler, R.H.; Alam, M.S.; Boyarski, A.M.; Breidenbach, M.; Burke, D.L.; Dorenbosch, J.; Dorfan, J.M.; Feldman, G.J.; Franklin, M.E.B.; Hanson, G.; Hayes, K.G.; Himel, T.; Hitlin, D.G.; Hollebeek, R.J.; Innes, W.R.; Jaros, J.A.; Jenni, P.; Larsen, R.R.; Lueth, V.; Perl, M.L.; Richter, B.; Roussarie, A.; Scharre, D.L.; Schwitters, R.F.; Siegrist, J.L.; Taureg, H.; Tonutti, M.; Vidal, R.A.; Weiss, J.M.; Zaccone, H.; Abrams, G.; Blocker, C.A.; Blondel, A.; Carithers, W.C.; Chinowsky, W.; Coles, M.W.; Cooper, S.; Dieterle, W.E.; Dillion, J.B.; Eaton, M.W.; Gidal, G.; Goldhaber, G.; Johnson, A.D.; Kadyk, J.A.; Lankford, A.J.; Millikan, R.E.; Nelson, M.E.; Pang, C.Y.; Patrick, J.F.; Strait, J.; Trilling, G.H.; Vella, E.N.; Videau, I. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03-76SF00515; W-7405-ENG-48. *Physical Review* [*Section*] *D: Particles and Fields ;* **24**: No. 1, 78-97(1 Jul 1981).

We present a study of the decay properties of charmed D mesons produced near the peak of the psi''(3770) resonance in e^+e^-

annihilation. Branching fractions for nine Cabibbo-favored and three Cabibbo-suppressed decay modes are presented along with upper limits on one additional Cabibbo-favored and four additional Cabibbo-suppressed decay modes. A study of $K\pi\pi$-decay-mode Dalitz plots reveals a large quasi-two-body pseudoscalar-vector component for the D^0 decays and an apparent nonuniform population on the Dalitz plot for the D^+ decay into $K^-\pi^+\pi^+$. Using tagged events, we measure the charged-particle multiplicity and strange-particle content of D decays. A measurement of the D^+ and D^0 semileptonic decay fractions indicates that the D^+ has a significantly longer lifetime than the D^0.

26487 Inclusive kaon charge exchange in the triple-Regge region at high energies. Yager, P.M.; Kobrak, H.G.E.; Pitt, R.E.; Swanson, R.A.; Edwards, K.W.; Harrison, M.; Abolins, M.A.; Francis, W.R.; Owen, D.P. (University of California, Davis, California 95616). DE-AT03-76E1270191. *Physical Review Letters ;* **46**: No. 21, 1358-1361(25 May 1981).

We present cross-section measurements for inclusive kaon charge exchange, (K⁻,p)→(K-bar⁰,X), at 68, 116, and 176 GeV/c in the kinematic region $x>0.7$ and $-t<1.3$ $(GeV/c)^2$. The results are in excellent agreement with the predictions of triple-Regge theory and for the first time confirm the dominance of the Regge-Regge-Pomeron terms.

26488 Correlations at small relative momenta among protons produced in collisions of 1.8 GeV/nucleon ^{40}Ar with a KCl target. Zarbakhsh, F.; Sagle, A.L.; Brochard, F.; Mulera, T.A.; Perez-Mendez, V.; Talaga, R.; Tanihata, I.; Carroll, J.B.; Ganezer, K.S.; Igo, G.; Oostens, J.; Woodard, D.; Sutter, R. (Lawrence Berkeley Laboratory, Berkeley, California 94720). W-7405-ENG-48; DOE-DE-AM03-76SF000L0-PA24. *Physical Review Letters ;* **46**: No. 19, 1268-1270(11 May 1981).

Correlations between two protons produced in the inclusive reaction Ar+KCl→p+p+X at 1.8 GeV/nucleon have been measured for proton rapidities near the beam rapidity Y/sub B/ and near Y/sub B//2. Comparison with model calculations suggests that the size of the region of final scatterings is 3.5 fm at Y/sub B/ and corresponds to that expected for a projectile remnant. The sizes we obtain for at Y/sub B//2 (with or without high multiplicity requirements) are smaller (2.4-2.8 fm) and seem inconsistent with a thermalized source containing a large fraction of the available nucleons.

26489 Measurement of the difference in pn total cross sections in pure longitudinal spin states. Auer, I.P.; Ditzler, W.R.; Hill, D.; Spinka, H.; Tamura, N.; Theodosiou, G.; Toshioka, K.; Underwood, D.; Wagner, R.; Yokosawa, A. (High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review Letters ;* **46**: No. 18, 1173-1177(4 May 1981).

The total-cross-section difference in pure longitudinal spin states for p-d interactions has been measured at momenta from 1.1 to 6 GeV/c. Spin-dependent Glauber-type corrections and other corrections have been made to obtain $\Delta\sigma$/sub L/(pn) and $\Delta\sigma$/sub L/(I = 0). These measurements are of fundamental interest and will also help in determining the existence and nature of dibaryon resonances.

26490 Measurement of the difference in pn total cross sections in pure longitudinal spin states. Auer, I.P.; Ditzler, W.R.; Hill, D.; Spinka, H.; Tamura, N.; Theodosiou, G.; Toshioka, K.; Underwood, D.; Wagner, R.; Yokosawa, A. (High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review Letters ;* **46**: No. 18, 1177-1180(4 May 1981).

The total—cross-section difference in pure longitudinal spin states for p-d interactions has been measured at momenta from 1.1 to 6 GeV/c. Spin-dependent Glauber-type corrections and other corrections have been made to obtain $\Delta\sigma$/sub L/(pn) and $\Delta\sigma$/sub L/(I = 0). These measurements are of fundamental interest and will also help in determining the existence and nature of dibaryon resonances.

26491 Pion-deuteron elastic scattering for momenta from 408 to 600 MeV/c. Minehart, R.C.; Boswell, J.S.; Davis, J.F.; Day, D.; McCarthy, J.S.; Whitney, R.R.; Ziock, H.J.; Wadlinger, E.A. (University of Virginia, Charlottesville, Virginia 22901). *Physical Review Letters ;* **46**: No. 18, 1185-1188(4 May 1981).

The differential cross section for elastic scattering of pions from deuterium has been measured for momenta of 408, 441, 539, and 600 MeV/c. The measurements confirm the energy dependence of a pronounced minimum around 100°, previously observed with lower-precision experiments. Our results are compared to calculations including effects of excitation of dibaryon resonances in the deuteron.

26492 Evidence for neutral A_1 and H resonances in charge exchange. Dankowych, J.A.; Martin, J.F.; Pawlicki, A.J.; Prentice, J.D.; Yoon, T.; Longacre, R.S.; Edwards, K.W.; Legacey, D.; Stanton, N.R.; Brockman, P.; Gandsman, J.; Patel, P.M.; Shabazian, E.; Zanfino, C. (University of Toronto, Toronto, Ontario M5S 1A7, Canada). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 2-4(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We present results from an isobar-model partial wave analysis of a high statistics sample of the neutral 3π system produced in forward charge exchange. Large forward phase motions relative to an exotic reference wave are seen for partial waves with the quantum numbers of the A_1 and of the previously unobserved H mesons.

26493 General features of the reaction $\pi^+p\to\Delta^{++}\pi^0\pi^0$ at 8 GeV/c. Cason, N.M.; Ahmed, M.U.; Baumbaugh, A.E.; Cannata, P.E.; Biswas, N.N.; Bishop, J.M.; Kenney, V.P.; Lawson, M.J.; Rey, C.A.; Ruchti, R.C.; Shephard, W.D.; Watson, J.M. (University of Notre Dame, Nortre Dame, Indiana 46556). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 5-7(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Characteristics of the reaction $\pi^+p\to\Delta^{++}\pi^0\pi^0$ at 8 GeV/c are presented. The sample consists of some 27, 000 events for which mass spectra, t-distributions, and $\pi\pi$ angular distributions are presented. The $\pi^0\pi^0$ mass spectrum rules out the "narrow ϵ (700)" solution for the $\pi\pi$ S_0 phase shift. Data in the 1300 MeV region show substantial S-D wave interference.

26494 Search for narrow BB (π) states in 16 GeV/c π^-p and 5 GeV/c p-barp interactions. Chung, S.U. (Physics Department, Brookhaven National Laboratory, Upton, New York 11973). DE-AC02-76CH00016. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 11-14(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We present the results of a search for narrow states in the p-barp, $Ap\pi^{+-}$ and p-barpπ^+ systems from π^-p interactions at 16 GeV/c. The data come from an experiment carried out by physicists from BNL, Brandeis, CCNY, Southeastern Massachusetts, University of Massachusetts.

26495 Review of N—N scattering. Yokosawa, A. (High Energy Physics Division, Argonne National Laboratory, 9700 South Cass Avenue Argonne, Illinois 60439). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 18-20(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We review structures appearing in various experimental data (particularly those with polarized beams) in nucleon-nucleon systems. We present a number of candidates for dibaryon resonances which can couple to nucleon-nucleon systems.

26496 Small angle hadron proton elastic scattering at Fermilab energies. Lach, J. (Fermilab, Batavia, Illinois). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 44-45(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

This paper summarizes contribution 476[1] and 477[2], two high statistics experiments on hadron proton elastic scattering. The first is a high statistics study of π^{+-}p and pp elastic scattering at 200 GeV/c in a range of $0.60<-t<0.02(GeV/c)^2$. The logarithmic slope, b, is found to increase substantially at small values of -t in agreement with a simple additive quark model (AQM). In the second contribution elastic scattering cross sections are measured on hydrogen in the Coulonb-nuclear interference region for π^{+-}p, K^{+-}p and p^{+-}p from 70 to 200 GeV/c.

26497 Direct single photon production and a search for diphoton resonance or continuum production at Fermilab energies. Cox, B. (Fermi National Accelerator Laboratory, Batavia, Ill.). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 137-139(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Direct single photon production at Fermilab energies is reviewed and the high mass diphoton spectrum produced in pp collisions at 400 GeV/c is examined for any evidence of diphoton continuum or resonance production.

26498 Anomalous low mass e^+e^- pair production in 17 GeV/c π^-p collisions. Abshire, G.; Adams, M.; Brown, C.; Cormell, L.; Crandall, E.; Donaldson, G.; Goldberger, J.; Gordon, H.; Grannis, P.; Meadows, B.; Morris, G.; Rehak, P.; Stekas, J. (Brookhaven National Laboratory, University of Pennsylvania,). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 158-160(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We have studied inclusive e^+e^- pair production using the BNL Mutliparticle Spectrometer, augmented with Li foil transition radiation detectors and Pb-scintillator shower detectors. Two triggers (PAIRA and PAIRB) selected e^+e^- pair events; PAIRA selected $x > 0.5$ while PAIRB had maximum acceptance for $x \sim 0.3$.

26499 Diffractive hadroproduction of charmed D mesons. Koester, L.J.; Alverson, G.; Ascoli, G.; Bender, D.; Cooper, J.; Holloway, L.; Kruse, U.; MacKay, W.; Sard, R.; Shupe, M.; Smith, E.; Kirk, T.B.W.; Raja, R.; Loomis, A.; Sessoms, A.; Wilson, R.; Tao, C.; Davies, J.; Quirk, T.; Thornton, R.; Milburn, R. (University of Illinois at Urbana-Champaign, 61801). DE-AC02-76ER01195. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 190-191(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We have observed charmed D meson production from a hydrogen target in a 217 GeV/c π^- beam. Hadronic decays in the $K^{+-}\pi^{+-}\pi^{+-}$ channels were reconstructed in the Chicago Cyclotron Spectrometer at Fermilab. The proton recoil angle and momentum transfer were programmed so that objects of mass near that of two D mesons would be produced in the forward direction. A mass peak in the 40-MeV bin at 1875 MeV was found in each channel. The cross section for D^{+-} production is 6—10 μb.

26500 Open and hidden charm muoproduction. Clark, A.R.; Johnson, K.J.; Kerth, L.T.; Loken, S.C.; Markiewicz, T.W.; Meyers, P.D.; Smith, W.H.; Strovink, M.; Wenzel, W.A.; Johnson, R.P.; Moore, C.; Mugge, M.; Shafer, R.E.; Gollin, G.D.; Shoemaker, F.C.; Surko, P. (Physics Department and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 212-219(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

New results are presented on open and hidden charm and bottom production by 209-GeV muons interacting in a magnetized steel calorimeter. The upper limit on the production of T states by muons is $\sigma(\mu N \rightarrow TX)B(T \rightarrow \mu\mu) < 22 \times 10^{-39}$ cm^2 (90% confidence level). The distributions of elastically produced psi's are consistent with s-channel helicity conservation (SCHC) and disagree with psi dominance. From analysis of dimuon final states the cross section for diffractive charm muoproduction is 6.9/sup +1.9//sub -1.4/ nb. The structure function F_2(cc-bar) for diffractive charmed-quark pair production is presented.

26501 Measurement of the J/psi photoproduction cross section. Cumalat, J.P. (Fermilab, Batavia, IL 60510). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 220(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

This paper reports on the preliminary measurement of the energy dependence of the J/psi photoproduction cross section over the energy range 60 to 225 GeV. The data was acquired using the Broadband Photon Beam and spectrometer in the Proton Area at Fermilab by a Fermilab University of Illinois collaboration, E-401.

26502 Parity violation in proton-nucleus scattering at 6 GeV/c. Lockyer, N.; Romanowski, T.A.; Bowman, J.D.; Hoffman, C.M.; Mischke, R.E.; Nagle, D.E.; Potter, J.M.; Talaga, R.L.; Swallow, E.C.; Alde, D.M.; Moffett, D.R.; Zyskind, J. (Department of Physics, Ohio State University, Columbus, Ohio 43210). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 318-321(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We have measured a parity-violating asymmetry in the total cross section for 6 GeV/c polarized protons on a water target. The asymmetry A/sub L/ = $(\sigma/\text{sub } +/-\sigma/\text{sub } -/)/(\sigma/\text{sub } +/+\sigma/\text{sub } -/)$, defined as the fractional difference of of the total cross sections for positive and negative helicity protons on an unpolarized target, was found to have the value A/sub L/ = $(2.61 +- 0.55) \times 10^{-6}$. The quoted error includes both statistical and systematic contributions.

26503 Neutrino oscillation phenomenlogy. Barger, V. (Physics Department, University of Wisconsin, Madison, WI 53706). DE-AC0276ER00881-169. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 334-340(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

New evidence of neutrino oscillation phenomena has recently been presented./sup 1,2/ In this report we briefly review the accumulated evidence regarding neutrino mass and oscillations.

26504 Observation of charmed F^+ meson produced by neutrino interaction in emulsion. Ammar, R.; Coppage, D.; Davis, R.; Kwak, N.; Riemer, R.; Stump, R.; Kautzky, H.; Smart, W.; Valen, S.; Voyvodic, L.; Ammosov, V.; Baranov, V.; Belkov, A.; Gapienko, V.; Klyukhin, V.; Koreshev, V.; Pitukhin, P.; Sirotenko, V.; Yarba, V.; Efremenko, V.; Egorov, O.; Goritchev, P.; Kaftanov, V.; Kolganova, N.; Kubantsev, M.; Makhlyueva, I.; Pozharova, E.; Shevchenko, V.; Smirnitsky, V.; Weissenberg, A.; Babecki, J.; Furmanska, B.; Holynski, R.; Jurak, A.; Krzywdzinski, S.; Nowak, G.; Wilczynski, H.; Wolter, W.; Wosiek, B.; Bunyatov, S.; Ivanova, M.; Kuznetsov, O.; Lyukov, V.; Sidorov, V.; Tchernev, H.; Bogomolov, K.; Burnett, T.; Lord, J.; Rosenbladt, R.; Wilkes, R.J. (University of Kansas, Lawrence, Kansas 66045). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 348-351(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Any event representing the production and decay of the charmed F^+ meson has been identified by means of a 3-constraint fit to the decay hypothesis $F^+ \rightarrow \pi^+\pi^+\pi^-\pi^0$, in which both γ-rays from the π^0 converted. The event was produced by a charged current ν/sub μ/ interaction in an emulsion stack located inside the Fermilab 15-foot bubble chamber. The F^+ traveled 50 μm, corresponding to a proper time of 1.4×10^{-13} seconds, before decaying in flight. Its mass was determined to be 2017 +- 25 MeV.

26505 Measurement of the vector and axial vector coupling constants in Λ0→p+e⁻ +nu-bar. Jensen, D.A.; Kreisler, M.N.; Lomanno, F.; Poster, R.; Rabin, M.S.Z.; Raychaudhuri, K.; Way, M.; Wise, J.; Humphrey, J. (University of Massachusetts, Amherst, MA 01003). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 364-367(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Preliminary results based on 10^4 Λ/sub β/ events (the full sample contains 10^5 events) are presented. The BR(Λ→pev-bar)/BR(Λ→pπ) is determined as (1.318 +- 0.024) x 10^{-3} and g_1 / f_1 is determined from a projection of the Dalitz Plot onto the cosθ/sub ev/ axis to be g_1 / f_1 = 0.734 +- 0.031. These values together with known factors yield f_1 = 1.229 +- 0.034 and g_1 = 0.903 +- 0.046.

26506 Measurement of the decays tau⁻→rho⁻ ν/sub tau/ and tau⁻→K⁻ (892)ν/sub tau/ using the Mark II detector at spear. Dorfan, J. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC0376SF00515;W-7405-ENG-48. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 368-372(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Measurement of the branching fractions for the Cabibbo flavored decay tau⁻→rho⁻ ν/sub tau/ and the Cabibbo suppressed decay tau⁻→K*⁻(892)ν/sub tau/ are presented. The energy dependence of the $\tau^+\tau^-$ production cross section is measured using the decay tau⁻→rho⁻ ν/sub tau/ which yields a measurement M/sub tau/ = (1790 +- 40) MeV. A 2σ upper limit for the forbidden decay tau⁻→K*⁻(1430)ν/sub tau/ is also presented.

26507 Recent results on decays of D mesons from Mark II. SLAC-LBL Mark II Collaboration. (Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720). W-7405-ENG-48;DE-AC03-76SF00515. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 373-379(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Recent results on the decay of charmed D mesons obtained with E/sub cm/ = 3.771 GeV at SPEAR using the Mark II detector are presented. Results on semileptonic branching fractions and decays into two-body final states are emphasized and suggest enhancement in nonleptonic D^0 decays relative to nonleptonic D^+ decays.

26508 Measurement of inclusive eta production in e⁺e⁻ interactions near charm threshold. Porter, F.C. ((Representing the Crystal Ball Collaboration) Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03076SF00515;DE-AC03-79ER0068. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 380-384(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We have measured the inclusive cross section for eta production in e^+e^- interactions near charm threshold using the Crystal Ball detector at SPEAR. By comparing the inclusive eta production above and below charm threshold we obtain the limits: R(e⁺e⁻→FFX) BR(F→etax)<0.3 (90% C.L., E/sub c.m./<4.5 GeV); BR(D→etax)<0.13 (90% C.L., averaged over charged and neutral D components of the psi").

26509 Radiative widths of K and rho mesons. Berg, D.; Chandlee, C.; Cihangir, S.; Ferbel, T.; Huston, J.; Jensen, T.; Lobkowicz, F.; Nelson, C.A. Jr.; Ohshima, T.; Slattery, P.; McLaughlin, M.; Thompson, P.A.; Biel, J.; Droege, T.; Jonckheere, A.; Koehler, P.F.; Collick, B.; Hepplemann, S.; Joyce, T.; Makdisi, Y.; Marshak, M.; Peterson, E.; Ruddick, K.; Shupe, M.; Walsh, T. (University of Rochester, Rochester, N.Y. 14627). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 537-538(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The dissociation of K and π mesons in the nuclear Coulomb field has been studied. Results are: Γ(rho→πγ) = 67 +- 7 KeV., Γ(K*(890)→Kπ) = 60 +- 15 KeV; and the observation of Coulomb excitation of the following states: K*(1420,1700),A_2,A_1,B. The measured widths are in rough agreement with a simple quark model.

26510 Magnetic moments of quarks in baryons and mesons. Rosner, J.L. (School of Physics and Astronomy, University of Minnesota, Minneapolis, Minnesota 55455). EY-76-C-02-1764. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 540-545(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Recent measurements of hyperon magnetic moments and of magnetic dipole transitions in meson radiative decays are discussed in the context of the nonrelativistic quark model. It is shown that this model works surprisingly well. Various "fine-tuning effects" are discussed, including configuration mixing in the baryons, quark anomalous moments, and SU(3) breaking.

26511 Measurement of the elastic electron-neutron cross section at high Q^2. Rock, S.; Arnold, R.G.; Chertok, B.T.; Mecking, B.A.; Schmidt, I.A.; Szalata, Z.M.; York, R.C.; Zdarko, R. (American University,Washington, D.C. 20016). DE-AC03-765F00515. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 550(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The ratio of the elastic electron-neutron to the elastic electron-proton cross section was measured to be about 0.3 at transverse momenta squared (Q^2) of 2.5, 4.0, 6.0 and 8.0 $(GeV/c)^2$.

26512 Two-photon results from SPEAR. Roussarie, A. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 573-575(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

I report results obtained by two experiments at SPEAR on the two-photon production of lepton pairs and resonances. Both experiments find agreement of lepton production with QED expectations, and observe an enhancement of the ππ mass spectrum in the 1250 MeV/c^2 region. The Mark II finds this enhancement not consistent with the decay of the f(1270 MeV/c^2) alone. The γγ partial width of the eta' has also been measured by the Mark II.

26513 TASSO results on jets and QCD. TASSO-Collaboration. (Aachen, Bonn, DESY, Hamburg, Imperial College, Rutherford, Oxford, Weizmann, Wisconsin). WY-76-C-02-0881. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 604-614(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Recent results obtained with the TASSO detector are presented, including in particular the values of jet fragmentation parameters found from the two-jet events, accurate determination of the quarkgluon strong coupling constant α/sub s/ to be 0.17 +- 0.02 +- 0.03, comparison with QCD, evidence that the gluon spin is 1, and the first observation of a long-range charge correlation in opposite jets from e^+e^-.

26514 Radiative transitions from the psi(3095) and psi'(3684) to ordinary hadrons. Scharre, D.L. (Stanford Linear Accelerator Centers, Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 668-674(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Mark II results from SPEAR on radiative transitions from the psi(3095) and psi'(3684) to ordinary hadrons (i.e., hadrons which do not contain charmed quarks to first order) are reviewed.

26515 Results on the Y resonances from the CUSB group at CESR. Yoh, J.K. (Columbia University, New York, NY 10027). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 700-704(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The CUSB NaI/ lead glass detector was used to measure hadronic events produced in e^+e^- collisions in the Y region at CESR, the Cornell Electron Storage Ring. Four enhancements, Y(1S), Y'(2S), Y"(3S) and Ytriple-prime(4S), have been observed. In contrast to the 3 lower resonances, Ytriple-prime(4S) has natural width of 12.6 +- 6 Mev, much broader than the width due to beam energy spread; this indicates that it is above the threshold for for production of B mesons. The Y' hadronic cascade decay into $\pi^+\pi^-$Y has been observed, confirming the hypothesis that Y' is an excited state of Y. Observation of an excess yield of energetic electrons in multi-hadron decays of the Ytriple-prime(4S) suggests a significant branching ratio for B→e + anything.

26516 First results on bare b physics. Thorndike, E.H. (University of Rochester, Rochester, NY 14627). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 705-711(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Production and decay properties of upsilon resonance as observed at CLEO are reviewed. (AIP)

26517 Recent results from the CFRR neutrino experiment at Fermilab. Barish, B.; Blair, B.; Chu, Y.; Jin, B.; MacFarlane, D.; Messner, R.; Lee, J.; Ludwig, J.; Novikoff, D.; Purohit, M.; Sciulli, F.; Shaevitz, M.; Edwards, D.; Fisk, E.; Fukushima, Y.; Yovanovitch, D.; Kerns, Q.; Kondo, T.; Rapidis, P.; Segler, S.; Stefanski, R.; Theriot, D.; Bodek, A.; Coleman, R.; Marsh, W.; Fackler, O.; Jenkins, K. (California Institute of Technology, Pasadena, California 91125). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 741-745(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Preliminary results from a new high-statistics study of neutrino and antineutrino interactions are presented. The full data sample includes 130,000 charged-current neutrino and 23,000 antineutrion events detected in the large acceptance Lab E neutrino target ar Fermilab with the N-30 dichromatic beam. Results based on a preliminary sample of one-third of the data are given for normalized cross sections and neutral currents.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 26510, 26559

26518 (ANL-HEP-CP—80-69) Spin effects in e^+e^- annihilations. Sivers, D. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 11p. (CONF-800994—17). NTIS, PC A02/MF A01. Order Number DE81024457.

From International symposium on H.E. physics with polarized beams and polarized targets; Lausanne, Switzerland (25 Sep 1980).

Methods for confronting current theoretical ideas with experiments involving polarized e^+e^- beams are examined. Despite limitations, such experiments can be informative and justifiable.

26519 (ANL-HEP-CP—80-75) Case for exotic baryon-baryon states. Thomas, G.H. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. (CONF-800994—18). NTIS, PC A02/MF A01. Order Number DE81024458.

From International symposium on H.E. physics with polarized beams and polarized targets; Lausanne, Switzerland (25 Sep 1980).

Three main points are presented. (1) Current theoretical prejudices are presented for why dibaryon states are interesting, and why they should be expected. (2) A review is given of some of the unsettled experimental issues which have emerged during this conference concerning dibaryons. (3) Phenomenological issues are raised which are critical to understanding whether dibaryon states are observable in the medium energy NN system.

26520 (LBL—12558) Topics in the theory of heavy-quark systems. Flory, C.A. (Lawrence Berkeley Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 94p. NTIS, PC A05/MF A01.

Thesis.

Due to the kinematic and dynamic simplifications possible because of the large mass of heavy quark bound states, certain properties of these systems can be quantitatively analyzed within the framework of quantum chromodynamics. It is clear that dimensionally the size of the bound state is proportional to the inverse quark mass, and for very heavy quarkonia the radius of the system should become smaller than that of normal hadrons. When this small system interacts with external long wavelength field quanta, the natural expansion that results is of a multipole type, analogous to the familiar multipole expansion in electrodynamics. This multipole expansion has better convergence properties than the standard perturbative treatment in certain kinematic regimes, which opens up a new area for strong interaction physics calculations. More specifically, it is ideally suited to investigate soft non-perturbative effects in QCD which appear to be so crucial to present day phenomenology and the conjectured confinement mechanism.

26521 (LBL—12840) Higgs phase in non-Abelian gauge theories. Kaymakcalan, O.S. (Lawrence Berkeley Lab., CA (USA)). Jun 1981. Contract W-7405-ENG-48. 82p. NTIS, PC A05/MF A01. Order Number DE81025327.

Thesis.

A non-Abelian gauge theory involving scalar fields with non-tachyonic mass terms in the Lagrangian is considered, in order to construct a finite energy density trial vacuum for this theory. The usual scalar potential arguments suggest that the vacuum of such a theory would be in the perturbative phase. However, the obvious choices for a vacuum in this phase, the Axial gauge and the Coulomb gauge bare vacua, do not have finite energy densities even with an ultraviolet cutoff. Indeed, it is a non-trivial problem to construct finite energy density vacua for non-Abelian gauge theories and this is intimately connected with the gauge fixing degeneracies of these theories. Since the gauge fixing is achieved in the Unitary gauge, this suggests that the Unitary gauge bare vacuum might be a finite energy trial vacuum and, despite the form of the scalar potential, the vacuum of this theory might be in a Higgs phase rather than the perturbative phase.

26522 Quantum mechanics of neutrino oscillation. Kayser, B. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *Physical Review [Section] D: Particles and Fields ;* **24**: No. 1, 110-116(1 Jul 1981).

We try to understand and to develop some of the basic quantum mechanics of neutrino oscillation. First, we observe that measurements which identify the physical neutrino (mass eigenstate) involved in each event of an experiment destroy any oscillation pattern. We explain how these measurements do that. Then, we construct a wave-packet treatment of neutrino oscillation. We find that it gives the same results as the standard treatment. Next, we estimate the distance a beam must travel before its different physical neutrinos, which have different speeds, will stop interfering with each other. Finally, we consider the possibility of observing the difference in the arrival times of the various physical neutrinos at a given point.

26523 Quarkonia and quantum chromodynamics. Buchmueller, W.; Tye, S.H. (Fermi National Accelerator Laboratory, P.O. Box 500, Batavia, Illinois 60510). *Physical Review [Section] D: Particles and Fields ;* **24**: No. 1, 132-156(1 Jul 1981).

The psi and Y spectroscopies are analyzed in the framework of a recently proposed potential model which incorporates linear confinement and asymptotic freedom. Given the Regge slope α' (α' taken to be 1 GeV^{-2}) and the quantum-chromodynamics (QCD) scale parameter Λ (Λ/sub M/S taken to be 0.5 GeV, where MS refers to the modified minimal-subtraction scheme) the potential is

completely determined. Excellent agreement with experiment is found, including in particular leptonic widths and hyperfine splittings. This supports a short-distance behavior of the quark-antiquark potential as predicted by QCD. We also demonstrate in a model-independent way that the psi and Y spectra provide a lower bound on the QCD scale parameter Λ; we find Λ/sub M/S>0.1 GeV. The properties of (bc-bar) and possible (tt-bar), (tc-bar), and (tb-bar) spectroscopies are studied, including weak-interaction effects. The implications of the psi, Y, and possible heavier quarkonium families for quantitative tests of QCD are discussed. It is shown that a (tt-bar) system with m(tt-bar)> or =40 GeV would provide an accurate determination of Λ/sub M/S.

26524 Generalized mixing angles in gauge theories with natural flavor conservation. Rothman, A.C.; Kang, K. (Department of Physics, The Ohio State University, Columbus, Ohio 43210). DE-AC02-76ER03130.A005 TASK A; EY-76-C-02-1545000. *Physical Review* [*Section*] *D: Particles and Fields ;* **24**: No. 1, 167-171(1 Jul 1981).

A number of theorems relating natural flavor conservation and calculability are proven for general gauge models of the weak and electromagnetic interactions with an unbroken U(1) symmetry. The concept of "nontriviality": a necessary condition that all naturally flavor-conserving gauge models must obey in order to have nontrivial mixing angles: is introduced. It is found that naturality groups guaranteeing natural flavor conservation connot generate meaningful mixing angles in any gauge model.

26525 Can quarks have integer charge?. Iijima, B.; Jaffe, R.L. (Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). DE-AC02-76ER03069. *Physical Review* [*Section*] *D: Particles and Fields ;* **24**: No. 1, 177-184(1 Jul 1981).

We construct a conservative model of quarks and gluons with the Han-Nambu charge assignment by slightly breaking the SU(3)/sub color/ x U(1) gauge symmetry observed at present energies. At very large masses, stable integrally charged colored quark states appear. The model is conservative in the sense that it differs as little as possible from conventional quark-gluon models at low energies. In particular, all conventional tests proposed to discriminate between fractional and integer quark charges fail. However, the model requires light charged Higgs scalars which should have been seen in $e^+e^-\rightarrow$ hadrons at present energies.

26526 How large are the neutrino mixing angles?. Goldman, T.; Stephenson, G.J. Jr. (Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review* [*Section*] *D: Particles and Fields ;* **24**: No. 1, 236-239(1 Jul 1981).

We find that in a broad class of theories consistent with grand unification, the neutrino mixing angles are likely to be comparable to the corresponding quark mixing angles and may well be much larger in an interesting special case. This result holds for a wide range of mass ratios for the light-neutrino Majorana masses.

26527 Same-sign dilepton puzzle. Barger, V.; Keung, W.Y.; Phillips, R.J.N. (Physics Department, University of Wisconsin: Madison, Madison, Wisconsin 53706). *Physical Review* [*Section*] *D: Particles and Fields ;* **24**: No. 1, 244-247(1 Jul 1981).

Same-sign dileptons produced in neutrino interactions are not explained by charm production in lowest-order quantum chromodynamics. We investigate whether νc-bar→μb-bar production with b-bar→c-bar→s-barlnu-bar cascade decay could account for the observed rates within the known constraints of weak universality, c-bar content of the nucleon, and trimuon results. Even with full-strength (c,b)/sub R/ coupling and maximal c-bar normalization, the b-bar mechanism is unable to explain the reported rate.

26528 Numerical computation of the renormalized effective potential in the strong-coupling limit. Bender, C.M.; Cooper, F.; Guralnik, G.S.; Roskies, R.; Sharp, D.H. (Department of Physics, Washington University, St. Louis, Missouri 63130). *Physical Review* [*Section*] *D: Particles and Fields ;* **23**: No. 12, 2999-3009(15 Jun 1981).

This is the second of three papers on the strong-coupling expansion of the renormalized effective potential in $gphi^4$ quantum field theory in d-dimensional Euclidean space-time. After a general discussion of our renormalization program, we perform a mass renormalization for each of the two lattice strong-coupling expansions for the wave-function renormalized effective potential that were computed in the previous paper. We describe strategies for obtaining the continuum limit of the renormalized lattice strong-coupling expansions in the limit $g\rightarrow\infty$. The results of extensive numerical calculations are reported for the leading term in the renormalized strong-coupling expansion for the coefficients of the effective potential.

26529 Importance of the Keta and Keta' decay modes in understanding charmed and other meson decays. Lipkin, H.J. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *Physical Review Letters ;* **46**: No. 20, 1307-1310(18 May 1981).

The $D^0\rightarrow$K-bar^{0}eta decay mode is shown to be suppressed by a large factor insensitive to eta-eta' mixing and SU(3) symmetry breaking in all transitions via intermediate states with flavor quantum numbers of a qq-bar pair, e.g., SU(3) octet, but to be roughly equal to the K-bar$^0\pi^0$ and K-bar^{0}eta' when produced via exotic qqq-barq-bar channels. The relative decay rates to K-bar^{0}eta, K-bar^{0}eta', and K-bar$^0\pi^0$ distinguish between models producing the additional qq-bar pair in weak or strong vertices.

26530 Dip and kink structures in high energy diffraction dissociation processes. Chou, T.T. (University of Georgia, Athens, Ga. 30602). DE-AS09-76ER00946. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 59(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The dip and shoulder structures observed in high energy diffraction dissociation experiments are discussed in the context of the geometrical picture.

26531 Review on DTU-parton model for hh and hA collisions. Chiu, C.B. (Center for Particle Theory, University of Texas, Austin, Texas). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 80-83(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Recently several groups have considered small-p/sub T/ models, which combine features from both the parton model and the DTU model. We shall refer to them loosely as the DTU-parton model. In this talk, we take a definite point of view to motivate this model, and based on this framework we briefly survey its phenomenological applications to hadron-hadron and hadron-nucleus collisions.

26532 QCD corrections to hadronic large p/sub T/ scattering. Hinchliffe, I. (Lawrence Berkeley Laboratory, Berkeley, California 94720). W-7405-ENG-48. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 114-117(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

QCD corrections to large p/sub T/ scattering are calculated. The status of the perturbation expansion is discussed.

26533 Higher twist QCD terms in high-P/sub T/ pion production. Berger, E.I.; Gottschalk, T.; Sivers, D. (High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 118-122(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We investigate the higher twist subprocesses $qG\rightarrow q\pi^{+-}$ and qq-bar$\rightarrow G\pi^{+-}$ in the framework of perturbative Quantum Chromodynamics (QCD). Cross sections for these processes are compared with the minimum twist QCD results for qq-bar→qq-bar and qG→qG. The higher twist terms give sizeable corrections to the in-

clusive pion yields, particularly for qq-bar initial states. We also examine the effects of higher twist QCD terms for the charge ratio, $N(\pi^- N \to \pi^- X)/ N(\pi^- N \to \pi^+ X)$.

26534 **Leptoproduction of heavy quarks.** Leveille, J.P.; Weiler, T. (Physics Department, University of Wisconsin, Madison, WI 53706). DE-AC02-76ER00881-170. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 263-267(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

. The photon-gluon fusion model of heavy quark production is reviewed. New, untested predictions are presented, and comments are made concerning the next order calculation.

26535 **Gluon fusion.** Barger, V.; Keung, W.Y.; Phillips, R.J.N. (Physics Department, University of Wisconsin, Madison, WI 53706). DE-AC0276ER00881-168. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 271-272(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The production of bound heavy flavors is successfully described by the mechanisms of (i) photon-gluon fusion in photoproduction and muoproduction, (ii) gluon-gluon fusion and quark-antiquark fusion in hadroproductuon. psi and Y cross section data specify x-dependences of the gluon distributions in hadrons in agreement with power counting. psi-production by neutrino beams is predicted from Z^0-gluon fusion.

26536 **New quark and weak boson signatures at p-barp colliders.** Halzen, F.; Scott, D.M. (Physics Department, University of Wisconsin, Madison, WI 53706). DE-AC02-76ER00881. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 273-276(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We discuss leptonic signatures of charm and bottom, the discovery of the top, and the shape of the lepton spectrum from W decay in p-barp interactions at root-bars≅540 GeV.[1]

26537 **Quark confinement.** Creutz, M. (Brookhaven National Laboratory, Upton, New York 11973). *AIP (American Institute of Physics) Conference Proceedings;* **68**: No. 1, 296-301(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

I review current theoretical evidence for the coexistence of asymptotic freedom and quark confinement in a non-Abelian gauge theory of the strong interaction.

26538 **Penguins and the $\Delta I = 1/2$ rule.** Hill, C.T. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 386-389(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We discuss the role of "penguin" operators in the weak decays of light particles, including an extra operator, O_7, entering in two loops. The evidence for large penguin contributions is reviewed and found to be uncompelling.

26539 **Role of non-spectator interactions in charm and bottom decays.** Barger, V.; Leveille, J.P.; Stevenson, P.M. (Physics Department, University of Wisconsin, Madison, WI 53706). DE-AC0276ER00881-158. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 390-395(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The role of annihilation and exchange diagrams in charmed meson, Λ/sub c/⁺ and B-meson decays is analyzed.

26540 **Radiative corrections in the standard model.** Ma, E. (Department of Physics and Astronomy, University of Hawaii at Manoa, Honolulu, Hawaii 96822). DE-AC03-76ER00511. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 422-426(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The effects of radiative corrections on the masses of the standard W and Z bosons as well as their decay widths and induced neutral-current couplings are briefly reviewed. In contrast, the model of Berezinsky and Smirnov, where all weak gauge boson masses can be substantially heavier than 100 GeV, is also described.

26541 **Multi-W and Z Bosons.** Barger, V.; Keung, W.Y.; Ma, E. (Physics Department, University of Wisconsin, Madison, WI 53706). DE-AC0276ER00881-166 AND DE-AC0376ER00511. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 427-430(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The standard SU(2) x U(1) model is extended to include multi-W and Z bosons without changing the structure of its low energy phenomenology. The lightest W and Z in these models must be lighter than the W and Z of the standard model.

26542 **Decoupling theorems and effective field theories.** Ovrut, B.A.; Schnitzer, H.J. (Department of Physics, Brandeis University, Waltham, MA 02254). EY-76-S-02-3230-A002. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 445-450(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The status of decoupling theorems and effective field theories is reviewed. It is emphasized that decoupling is valid for minimal subtraction if an effective field theory with appropriate effective couplings is constructed.

26543 **Calculability of the N-P mass difference in gauge theories.** Kiskis, J. (Theoretical Division, Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 455-459(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The requirement of a calculable N-P mass difference leads to a consideration of unified gauge theories. Future developments in grand unified models may provide a realistic framework for the calculation of the N-P mass difference. The possibility that the relatively soft ultraviolet behavior of QCD softens the divergence in the lowest order electromagnetic mass shift is considered in detail. It is shown that if the bare mass and QCD coupling are constrained to be independent of the electromagnetic coupling, as is natural, then the lowest order electromagnetic shifts of the renormalized mass and QCD coupling are infinite.

26544 **Neutrino oscillations of the second class.** Barger, V.; Leveille, J.P.; Langacker, P.; Pakvasa, S. (Physics Department, University of Wisconsin, Madison, WI 53706). DE-AC0276ER00881-167. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 483-487(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

We consider a second class of neutrino oscillations which can arise when both Majorana and Dfirac neutrino mass terms are present in the Lagrangian. These oscillations mix neutrino members of weak current doublets with singlets of the same chirality. A depletion of a neutrino beam would result, with apparent non-conservation of probability. Possible relevance to current oscillation experiments is discussed.

26545 Dynamical symmetry breaking and hypercolor. Beg, M.A.B. (The Rockefeller University, New York, N.Y. 10021). DE-AC02-76ER02232B. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 489-492(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The use of hypercolor, for implementing the Higgs mechanism and establishing gauge hierarchies in a dynamical way, is described and discussed. Phenomenological implications of the scheme are examined and its experimental signatures are contrasted with those of the canonical theory with elementary spin-0 fields.

26546 Suppression of superheavy magnetic monopoles in grand unified theories. Pi, S. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 505-508(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The superheavy magnetic monopoles predicted by grand unified theories would not be produced in significant numbers if electromagnetic gauge invariance is spontaneously broken when the temperature T is greater than T/sub c/> or $\approx$1 TeV.

26547 Quark flavor mixing and its physical implications. Chau Wang, L. (Brookhaven National Laboratory, Upton, New York 11973). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 510-516(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

This is a very fast developing field and the amount of literature on the subject is vast. It is impossible not to miss quoting some papers. I intend to inform you of the scope of the developments on the subject of flavor mixing, especially the Kobayashi-Maskawa model, since the Tokyo conference in 1978.

26548 Structure functions and high twist contributions in perturbative quantum chromodynamics. Brodsky, S.J.; Lepage, G.P. (Stanford Linear Accelerator Center Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 568-572(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Perturbative QCD predictions are presented for the x near 1 behavior of hadronic structure functions. The available energy xW^2 is shown to control structure function evolution. In the case of meson structure functions, the $x\sim1$ behavior is dominated by a high twist contribution to the longitudinal structure function F/sub L/$\sim Cx^2/Q^2$ which can be rigorously computed and normalized.

26549 Using e^+e^- cross-sections to test QCD and to search for new particles. Barnett, R.M. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 639-643(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

A careful analysis is presented of the most recent data for R($e^+e^-\rightarrow$ hadrons) using improved theoretical techniques. Recent calculations of higher-order corrections are discussed. It shown why R is potentially one of the best tests of QCD. For root-bars near 7 GeV, the data lie about 16% above the theory; the experimental uncertainty is +- 10% (dominated by systematics). While this discrepancy may well be due to experimental problems, we also consider the possibility that there is a threshold for new particles (at root-barsroughly-equal6 GeV) such as new quarks, Higgs bosons, heavy leptons, quixes and massive gluons.

26550 Inverse scattering and the Y family. Quigg, C.; Rosner, J.L. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). EY-76-C-02-1764. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 719-724(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

A quarkonium potential is constructed with the help of masses and leptonic widths of the Y(lS-4S) levels using the inverse scattering formalism. This potential agrees at all interquark separations beyond 0.06f with one constructed earlier from psi and psi', providing further evidence for flavor independence of the QQ interaction. Comparison with other a priori potentials suggests that tests for a short-range Coulomb interaction (as predicted by QCD) will have to rely primarily on more precise values for $\Gamma(Y\rightarrow e^+e^-)$, on measurement of the 2S-2P spacing (predicted to be about 120 MeV for a short-range Coulomb-like interaction or in the inverse scattering formalism but about 150 MeV for an effective power-law potential), and on the discovery of heavier quarks.

26551 QCD corrections to quarkonia decays. Celmaster, W. (Argonne National Laboratory, Argonne, IL 60439). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 725-727(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

A summary is given of recent work done on QCD corrections of hadronic decays of quarkonia. Particular attention is given to the decay n/sub Q/$\rightarrow$ hadrons.

26552 Quantum chromodynamics and deep-inelastic scattering. Buras, A.J. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 785-796(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Moments of deep-inelastic structure functions, parton distributions and parton fragmentation functions are discussed in the context of Quantum Chromodynamics with particular emphasis put on higher order corrections. A brief discussion of higher twist contributions is also given.

26553 Structure functions and high twist contributions in perturbative quantum chromodynamics. Brodsky, S.J.; Lepage, G.P. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 805-809(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Perturbative QCD predictions are presented for the x near 1 behavior of hadronic structure functions. The available energy xW^2 is shown to control structure function evolution. In the case of meson structure functions, the $x\sim1$ behavior is dominated by a high twist contribution to the longitudinal structure function F/sub L/$\sim Cx^2/Q^2$ which can be rigorously computed and normalized.

26554 (cc)-(anti canti c) (diquark-antidiquark) states in e^+e^- annihilation. Chao, K.T. (Fermi National Accelerator Lab., Batavia, IL (USA)). *Zeitschrift fuer Physik [Sektion] C: Particles and Fields ;* **7**: No. 4, 317-320(1981).

The mass spectrum and decay modes of the (cc)-(anti canti c) states are estimated in a quark-gluon model. We argue that the peculiar resonance-like structures of R($e^+e^-\rightarrow$ hadrons) for $\sqrt{s}$ = 6 to 7 GeV may be due to production of the P-wave (cc)-(anti canti c) states. They are predicted to lie in the range 6.4 to 6.8 GeV and mainly decay into charmed mesons.

26555 Jet expectations for near future facilities. Gottschalk, T. (Argonne National Lab., IL). pp 43p, Paper 12 of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

Perturbative jet properties (as defined by infrared safe analysis of exact 2 → 3 QCD amplitudes) are compared with simple leading-log expectations. These comparisons suggest that, even at tevatron energies, the properties of a quark jet can still be largely dependent on specifics of the production mechanism. The simple picture of independent jet evolution is probably not a quantitative description until extremely high energies.

26556 Pair production of intermediate vector bosons. Mikaelian, K.O. (Oklahoma State Univ., Stillwater). pp 24p, Paper 15 of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

The production of intermediate vector boson pairs W^+W^-, Z^0Z^0, $W^{+-}Z^0$ and $W^{+-}\gamma$ in pp and p anti p collisions is discussed. The motivation is to detect the self-interactions among the four intermediate vector bosons.

26557 Nonleptonic decays of charmed mesons. Part 2. Tests for the pole model in exclusive and semi-inclusive decays of the D^0-meson. Rosen, S.P. (Los Alamos Scientific Lab., NM). pp 9p, Paper 9B of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

The pole model for D^0-nonleptonic decay implies that the final state has isospin 1/2. Experimental branching ratios are consistent with this selection rule, but the Dalitz plot for $K\pi\pi$ decay modes will have to show nonuniform structure in order to agree with it.

26558 Nonleptonic decays of charmed mesons. Part 3. Tests of isospin selection rules in exclusive and semi-inclusive decays of charged D-mesons. Rosen, S.P. (Los Alamos Scientific Lab., NM). pp 14p, Paper 9C of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

In the Cabibbo-allowed decays of the charged D-meson, the standard model predicts that the isospin of the final state must be pure T = 3/2 for nonleptonic decays, and T = 1/2 for semi-leptonic decays. The consequences of these isospin rules for the ratios of K^- final states to anti K^0 final states are determined in both exclusive channels and in semi-leptonic ones. These ratios are bounded, and present data do not violate these bounds, but they are too sparse to make any definitive tests. Other predictions of the selection rules, such as the Dalitz plot for anti $K\pi\pi$ modes are also discussed.

6453 Particle Invariance Principles And Symmetries

REFER ALSO TO CITATION(S) 26502, 26570

26559 (ANL-HEP—80-77) Past lessons and future importance of polarization. Lipkin, H.J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 21p. (CONF-800994—16). NTIS, PC A02/MF A01. Order Number DE81024461.

From International symposium on H.E. physics with polarized beams and polarized targets; Lausanne, Switzerland (25 Sep 1980).

Polarization and spin effects have traditionally brought surprises to physicists particularly to those who thought that such effects were unimportant. In hadron physics, large unexplained effects keep turning up and are still unresolved puzzles. A good measurement of the uninteresting beta ray polarization could have discovered parity nonconservation many years before its prediction by Lee and Yang. Nobody knows whether there are further exciting discoveries of this kind waiting for polarization experiments.

26560 Experimental constraints on models of CP violation. Schmidt, M.P.; Adair, R.K.; Black, J.K.; Blatt, S.R.; Campbell, M.K.; Kasha, H.; Larsen, R.C.; Leipuner, L.B.; Morse, W.M. (Yale University, New Haven, CT. 06520). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 322-325(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

A review is presented of the experimental efforts at the Brookhaven AGS to study the nature of CP violation in the decays of kaons. Current research focuses on sensitive searches for a violation of time-reversal (T) invariance in the decay $K\rightarrow\pi\mu\nu$/sub μ/ as evidenced by a nonzero component of muon polarization normal to the decay plane. Results are discussed for the decay K/sub L/ $^0\rightarrow\pi^-\mu^+\nu$/sub μ/, and preliminary results for the decay $K^+\rightarrow\pi^0\mu^+\nu$/sub μ/ are presented.

26561 CP violation in the six-quark model. Wise, M.B. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 398-403(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Some of the recent work on CP violation in the six-quark model is reviewed.

26562 Sequential internal supersymmetry. Ne'eman, Y.; Sternberg, S. (Tel Aviv University, Tel Aviv, Israel). EY-76-S-05-3992. *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 460-462(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The supergroups SU(2/1), SU(5/1) and SU(5 = k/1) provide fitting classifications, unifying weak-electromagnetic, color, and sequential flavor respectively.

26563 CP violation at high energies. Gaillard, M.K. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *AIP (American Institute of Physics) Conference Proceedings ;* **68**: No. 1, 517-523(Feb 1981). (CONF-800724—).

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The high energy sector of gauge theories with hard CP violation is discussed with emphasis on "strong" CP violation and baryon number generation.

26564 Technicoloured signatures. Dimopoulos, S. (Stanford Univ., CA). pp 47p, Paper 23 of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

Scalarless theories with extended technicolor have several new consequences at energies of a few hundred GeV which will be accessible in future accelerators. A large class of such theories have several (60 or 116 or 132) pseudo-Nambu-Goldstone bosons with masses from a few GeV to ~ 300 GeV. These bosons are classified and their model independent properties are discussed. Their most important properties are: (1) they can be singly produced; (2) their decays give rise to some exotic final states involving jets; and (3) more than 90% of them are colored. Therefore, they can be produced in the future anti pp and pp machines, predominantly via 2 gluon collisions.

26565 Could Higgs bosons be found before LEP. Kane, G.L. (Univ. of Michigan, Ann Arbor). pp 29p, Paper 26 of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

A number of possibilities for finding neutral or charged Higgs bosons, or their effects, are suggested or reviewed.

6454 Field Theory

REFER ALSO TO CITATION(S) 26497, 26510, 26513, 26514, 26523, 26525, 26528, 26531, 26532, 26533, 26535, 26536, 26537, 26538, 26540, 26541, 26542, 26544, 26545, 26546, 26547, 26548, 26549, 26550, 26551, 26552, 26553, 26561, 26562, 26563

26566 (BNL—29548) Comments on the linear system for the self-dual Yang-Mills fields. Wang, L.C. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 16p. (CONF-810257—1). NTIS, PC A02/MF A01. Order Number DE81025076.

From 18. winter school of theoretical physics; Karpacz, Poland (18 Feb 1981).

One way of linearizing the self-dual Yang-Mills equations using the infinite non-local currents, the properties of such linear systems, and the solutions to such linear equations in the case of n-instanton with (5n+4) parameters are discussed. Finally the connection with the linear system of Belavin-Zakharov, and the Atiyah-Ward construction for the self-dual Yang-Mills equation. This is more or less in the time sequence of our understanding of the subject.

26567 Strong-coupling expansion for the effective potential on a lattice. Bender, C.M.; Cooper, F.; Guralnik, G.S.; Roskies, R.; Sharp, D.H. (Department of Physics, Washington University, St. Louis, Missouri 63130). *Physical Review [Section] D: Particles and Fields ;* **23**: No. 12, 2976-2998(15 Jun 1981).

This is the first of three papers on the strong-coupling expansion of the renormalized effective potential in gphi^4 quantum field theory in d-dimensional Euclidean space-time. In this paper we show how to express the effective potential in terms of one-particle-irreducible strong-coupling graphs. We describe two methods for obtaining analytic expressions for the vertices of these graphs. We also present an algebraic technique for evaluating the graphs on a Euclidean space-time lattice in arbitrary dimension d.

26568 Vortex excitations in the Weinberg-Salam theory. Huang, K.; Tipton, R. (Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics,Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). DE-AC02-76ER03069. *Physical Review [Section] D: Particles and Fields ;* **23**: No. 12, 3050-3057(15 Jun 1981).

It is shown that, in the Weinberg-Salam theory, there are metastable states in which the Higgs field is expelled from the interior of a torus by a trapped quantum of the Z field. Called "vorticons," they are scalar particles that decay via the decay modes of the Z. A variational calculation estimates the mass to be of the order of 3000 GeV/c^2. The "macroscopic" vortex rings, in which the trapped Z field is so strong that it becomes classical, are not even metastable; they tend to collapse into vorticons.

26569 Phase transitions and bounds on Higgs-boson masses. Scanio, J.J.G.; Suranyi, P. (University of Cincinnati, Cincinnati, Ohio 45221). DE-AC02-76ER-02978-A004. *Physical Review Letters ;* **46**: No. 20, 1311-1314(18 May 1981).

Upper bounds on the critical temperature are found in terms of the Higgs boson mass in SU(N) and SU(2) x U(1) gauge theories. Also an upper bound on the Higgs boson mass as a function of the supercooling ratio is found provided quantum tunneling is not sufficient to complete the phase transition from a symmetric phase to a broken phase.

26570 Can there be low intermediate mass scales in grand unified theories?. Rizzo, T.G.; Senjanovic, G. (Department of Physics, Brookhaven National Laboratory, Upton, New York 11973). *Physical Review Letters ;* **46**: No. 20, 1315-1317(18 May 1981).

It is well known that the simple grand-unified theories, such as O(10), allow the mass scale at which the parity is presumably restored to be as low as 100 —200 GeV.

26571 Internal supersymmetry and unification. Ne'eman, Y.; Sternberg, S. (Tel Aviv Univ., Israel). Contract AS02-78ER04742;EY-76-S-05-3992. *Proceedings of the National Academy of Sciences of the United States of America ;* **77**: No. 6, 3127-3131(Jun 1980).

A family of finite-dimensional representations of the superalgebra sl(n/m) that depend on an integer parameter for $m > 1$ and on a complex parameter, b, for $m = 1$ is constructed. Some models of elementary particles for sl(2/1), sl(3/1), and sl(5/1) are described. This involves the choice of the parameter b and the choice of the operators I_3 (the third component of the weak left-handed isospin) and U (the weak hypercharge). These must commute, and are related to the electric charge by the usual formula $Q = I_3 + 1/2\ U$.

26572 Components of QCD. Sivers, D. (Argonne National Lab., IL). pp 45p, Paper 11 of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

Some aspects of a simple strategy for testing the validity of QCD perturbation theory are examined. The importance of explicit evaluation of higher-order contributions is illustrated by considering z_0 decays. Recent progress toward understanding exclusive processes in QCD is discussed and some simple examples are given of how to isolate and test the separate components of the perturbation expansion in a hypothetical series of jet experiments.

26573 Fun with W, Z, H, and G's. Ma, E. (Univ. of Hawaii, Honolulu). pp 7p, Paper 25 of Proceedings of topical workshop on the production of new particles in super high energy collisions. Barger, V.; Halzen, F. (eds.). Madison, WI; University of Wisconsin (1979).

From Workshop on the production of new particles in super high energy collisions; Madison, WI, USA (22 Oct 1979).

Possible departures from the canonical orthodoxy represented by the Weinberg-Salam model and QCD are discussed. A model with 2 W's and 2 Z's is presented, as well as speculations on the Higgs-boson mass and the number of flavors and colors.

65 PHYSICS RESEARCH

6510 Nuclear Physics

26574 (LBL—12596) Experimental evidence and theoretical implications of fluctuations in deep inelastic heavy ion collisions. Moretto, L.G. (Lawrence Berkeley Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 26p. (CONF-8106114—1). NTIS, PC A03/MF A01. Order Number DE81025329.

From Europhysics conference on nuclear physics; Hvar, Croatia, Yugoslavia (29 Jun 1981).

The role of fluctuations in deep inelastic collisions is discussed. The relevance of the statistical equilibrium limit to the description of substantially relaxed degrees of freedom is assessed. The effects of fluctuations are considered specifically for the following processes: (a) the correlation between entrance-channel angular momentum and exit-channel kinetic energy; (b) the sharing of the dissipated kinetic energy between the two fragments; (c) the alignment of the fragment angular momentum. It is found that statistical fluctuations play a major role and that the statistical equilibrium limit seems to have been reached in a number of instances.

6512 Nuclear Properties And Reactions, A=1-5

26575 Inclusive reactions of pions on nuclei. McKeown, R.D.; Sanders, S.J.; Schiffer, J.P.; Jackson, H.E.; Paul, M.; Specht, J.R.; Stephenson, E.J.; Redwine, R.P.; Segel, R.E. (Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 211-220(Jul 1981).

A systematic set of measurements of pion and proton yields from pion reactions on nuclei 4< or =A< or =180 has been per-

formed for incident pions in the Δ(3,3) energy region. Detailed energy spectra for protons at many angles were obtained along with inclusive pion yields. The implications of general features of these data for the pion absorption and scattering processes are discussed.

26576 Zero-crossing angle in the np analyzing power at medium energies and its relation to charge symmetry. Bhatia, T.S.; Glass, G.; Hiebert, J.C.; Northcliffe, L.C.; Tippens, W.B.; Bonner, B.E.; Simmons, J.E.; Hollas, C.L.; Newsom, C.R.; Riley, P.J.; Ransome, R.D. (Texas A&M University, College Station, Texas 77843). *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 321-324(Jul 1981).

The angle at which the analyzing power for free np scattering becomes zero, the zero-crossing angle θ_0, has been measured simultaneously for the np and np scattering processes at 425, 565, and 665 MeV incident neutron energies. A rather strong energy dependence of the zero-crossing angle is found. Knowledge of this energy dependence is important in designing an experiment which tests for charge symmetry breaking forces by comparing high precision measurements of θ_0(np) and θ_0(np).

6513 Nuclear Properties And Reactions, A=6-19

REFER ALSO TO CITATION(S) 26575, 26596, 26603, 26603

26577 (CONF-801111—47) Nuclear cross sections for light ions on ^{6}Li. Holland, R.E.; Elwyn, A.J.; Davids, C.N.; Meyer-Schuetzmeister, L.; Monahan, J.E.; Mooring, F.P.; Ray, W. Jr. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01. Order Number DE81023803.

From 6. conference on application of accelerators in research and industry; Denton, TX, USA (Nov 1980).

We review our measurements of total and differential cross sections for protons, deuterons and ^{3}He incident on ^{6}Li. These are the reactions which are important for evaluating a fusion reactor based on burning ^{6}Li. Several of these reactions had not previously been measured, and among those that had there were large discrepancies in some cases. We employed several checks in our measurements to verify that the errors (including systematic errors) were 10 to 20%.

26578 Elastic pion double charge exchange reactions. Miller, G.A. (Institute for Nuclear Theory and Physics Department, FM-15, University of Washington, Seattle, Washington 98195). *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 221-223(Jul 1981).

Results of simple sequential model calculations are presented and compared with experimental data covering a wide variety of targets and energies. The model is fairly successful at higher energies (greater than about 200 MeV) but fails badly at lower energies.

26579 Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca. Morris, C.L.; Boyer, K.G.; Moore, C.F.; Harvey, C.J.; Kallianpur, K.J.; Moore, I.B.; Seidl, P.A.; Seestrom-Morris, S.J.; Holtkamp, D.B.; Greene, S.J.; Cottingame, W.B. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 231-235(Jul 1981).

Pion inelastic scattering at 180 MeV from the low-lying collective states of ^{12}C and ^{40}Ca is analyzed using distorted-wave impulse approximation calculations with no free parameters and transition densities obtained from electron scattering. These calculations adequately reproduce the pion scattering data. No significant π^+ vs π^- differences are observed at low-momentum transfers.

26580 Beta-ray branching in the decay of ^{20}F. Alburger, D.E.; Warburton, E.K. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 296-297(Jul 1981).

Measurements on the γ-ray spectrum from 11-sec ^{20}F resulted in an energy of 3332.51(19) keV for the cascade γ ray from the ^{20}Ne 4.97-MeV state and a β-branching intensity to this level of 0.90(4) x 10^{-4} per decay. The corresponding log f_0t value is 7.16(2), and the excitation energy of the ^{20}Ne state is 4966.51(20) keV.

6514 Nuclear Properties And Reactions, A=20-38

REFER ALSO TO CITATION(S) 26575, 26578, 26580, 26580

6515 Nuclear Properties And Reactions, A=39-58

REFER ALSO TO CITATION(S) 26578

26581 (ORNL/TM—7752) Calculation of neutron and gamma-ray production cross sections for calcium from 8 to 20 MeV. Hetrick, D.M.; Fu, C.Y. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 45p. (ENDF—308). NTIS, PC A02/MF A01.

Nuclear model calculations used for the previous evaluation for calcium (ENDF/B-V MAT 1320) lacked the effects of precompound particle emission. Experimental information now available suggests that these effects are significant from 8 to 20 MeV. Results of new calculations made to include such effects in all reaction cross sections from 8 to 20 MeV are presented. The resulting data set was prepared in the ENDF/B-V format and is referred to as Material 4152 Modification V in the DNA cross-section library.

26582 Strong j-dependent effects in (^{7}Li, ^{6}Li) reactions. Santos, F.D.; Goncalves, A.M. (University of Wisconsin, Madison, Wisconsin 53706). *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 156-165(Jul 1981).

The analyzing powers of heavy ion induced transfer reactions are discussed within the framework of the distorted-wave Born approximation using a semiclassical model to describe the conservation of kinetic energy in the transfer process. It is found that the analyzing powers T/sub k/q with k odd have a strong dependence on Q value. Those T/sub k/q with k even have a weaker Q dependence and are specially sensitive to the deformed shape of the projectile. Strong j-dependent effects are found in the analyzing powers of (^{7}Li, ^{6}Li) reactions, particularly in T/sub 2q/ and iT/sub 3q/. Calculations for the ^{58}Ni(^{7}Li, ^{6}Li)^{59}Ni reaction at E/sub Li/ = 20.3 MeV are in good agreement with cross section and iT_{11} angular distribution data.

6516 Nuclear Properties And Reactions, A=59-89

26583 (BNL—29658) Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$. Haustein, P.E.; Lister, C.J.; Alburger, D.E.; Olness, J.W.; Saha, S. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 6p. (CONF-810649—4). NTIS, PC A02/MF A01. Order Number DE81025094.

From 4. international conference on nuclei far from stability; Helsignor, Denmark (7 Jun 1981).

Heavy-ion reactions induced by beams of ^{24,25,26}Mg and ^{28}Si on targets of ^{58}Ni and ^{60}Ni have been used to produce a number of new or poorly characterized radioactivities with $79 \leqq A \leqq 84$ and $N \approx Z$. The helium-jet recoil transfer technique was employed as a means of continuously preparing essentially massless sources of these radioactivities for extensive x-, γ-, and β-ray singles and multiparameter coincidence spectroscopic measurements. The low lying level structure of ^{80}Sr has been revealed for the first time by the decay of a new isotope ^{80}Y (T/sub 1/2/ = 34 s). These measurements have also resulted in a considerable clarification of the decay properties of ^{79}Sr and ^{81,82}Y. Decay energies, Q/sub EC/, and nuclidic mass excesses deduced from them, both show progressively larger deviations from the predictions of currently available mass models for these isotopes, especially as the N = Z line is approached. Preliminary decay data are reported for ^{83}Zr and ^{84}Nb, which were both produced as evaporation residues from the ^{28}Si + ^{58}Ni reaction.

26584 Collective and neutron-structure effects in the elastic scattering of vector polarized deuterons in the A = 90 mass region. Bieszk, J.A.; Ulbricht, J. (University of Wisconsin, Madison, Wisconsin 53706). *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 56-58(Jul 1981).

The analyzing power has been measured for elastic scattering of vector-polarized deuterons from /sup 92,94,96/Zr and ^{92}Mo

at E/sub d/ = 12 MeV. Previous measurements on ^{88}Sr and ^{98}Mo have been extended. The present data combined with published measurements on /sup 90,91/Zr and /sup 76,78,80,82/Se show that these angular distributions can be explained only if one considers both collective and neutron structure-dependent effects.

26585 High spin structure of ^{75}Br and the (N,Z) dependence of the nuclear deformation in the Br region. Kreiner, A.J.; Mariscotti, M.A.J.; Baktash, C.; der Mateosian, E.; Thieberger, P. (Departamento de Fisica, Comision Nacional de Energia, Atomica, 1429 Buenos Aires, Argentina). *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 148-155(Jul 1981).

High spin states of ^{75}Br were studied through the ^{62}Ni (^{16}O,2np) reaction. A positive and a negative parity band were established up to spin (25/2). A new low-lying isomeric (9/2$^+$) state (T/sub 1/2/ = 39 +- 4 ns) at 220.6 keV excitation energy, most likely of pi-tildeg/sub 9/2/ parentage, was found. The structure was interpreted in the light of the one quasiparticle plus rotor model concluding that the quadrupole deformation is largest for ^{75}Br compared to all other known odd Br isotopes.

26586 High-spin states and band structure in ^{76}Br. Wells, J.C.; Robinson, R.L.; Kim, H.J.; Sayer, R.O.; Piercey, R.B.; Ramayya, A.V.; Hamilton, J.H.; Maguire, C.F.; Kumar, K.; Eastes, R.W.; Barclay, M.E.; Caffrey, A.J. (Physics Department, Tennessee Technological University, Cookeville, Tennessee 38501). *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 171-179(Jul 1981).

High-spin states of ^{76}Br have been investigated through observations of γ rays produced in the ^{66}Zn(^{12}C,pn) reaction by bombarding an enriched ^{66}Zn target with 38.0-MeV ^{12}C ions. Measurements were made of γ-ray singles and γ-γ coincidence spectra, γ-ray angular distributions, and γ-ray linear polarizations. Level energies, decay modes, spins and parities, γ-ray branching ratios, and γ-ray radiative admixtures were deduced. There is evidence for a strongly excited $\Delta J = 1$ quasirotational band.

26587 Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near N~50. Lee, I.Y.; Johnson, N.R.; McGowan, F.K.; Young, G.R.; Guidry, M.W.; Yates, S.W. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). W-7405-ENG-26. *Physical Review [Section] C: Nuclear Physics ;* **24**: No. 1, 293-295(Jul 1981).

A search for isomers in the N~50 region has produced no evidence of high-spin yrast isomerism. A new 4.5-ns low-multiplicity isomer has been identified and assigned to ^{94}Tc, while the yrast sequence of ^{94}Tc has been established to more than 5 MeV in excitation energy.

26588 Observation of giant dipole resonances built on states of high energy and spin. Newton, J.O.; Herskind, B.; Diamond, R.M.; Dines, E.L.; Draper, J.E.; Lindenberger, K.H.; Schueck, C.; Shih, S.; Stephens, F.S. (Nuclear Science Division, Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). W-7405-ENG-48. *Physical Review Letters ;* **46**: No. 21, 1383-1386(25 May 1981).

Spectra of γ rays in the 2—30-MeV range have been observed following ^{40}Ar-induced reactions leading to the ^{122}Te, ^{150}Gd, and ^{164}Er systems. Shoulders in the spectra for E/sub γ/ >10 MeV are interpreted as arising from the giant dipole resonance and are consistent with statistical-model calculations using the giant-dipole-resonance strength function. Their observation offers the possibility of studying nuclear shapes and dynamics as functions of temperature and spin.

6517 Nuclear Properties And Reactions, A=90-149

REFER ALSO TO CITATION(S) 26584, 26587, 26587, 26588, 26588, 26596

26589 (LA-UR—81-1593) Nuclei far from stability using exotic targets. Wilhelmy, J.B.; Bentley, G.E.; Thomas, K.E.; Brown, R.E.; Flynn, E.R.; Van der Plicht, J.; Mann, L.G.; Struble, G.L. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 7p. (CONF-810649—1). NTIS, PC A02/MF A01.

From 4. international conference on nuclei far from stability; Helsignor, Denmark (7 Jun 1981).

The meson factories such as the Los Alamos Meson Physics Facility have made possible high fluence medium energy proton beams that can be used for spallation reactions to produce macro quantities of unstable isotopes. Targets of over 10 g/cm^2 can be exposed to total fluence approaching 1 A-hour resulting in spallation yields in the 0.01-10 mg range for many isotopes of potential interest for nuclear structure studies. With the use of hot cell facilities, chemical processing can isolate the desired material and this coupled with subsequent isotope separation can result in usable quantities of material for nuclear target application. With off-stable isotopes as target materials, conventional nuclear spectroscopy techniques can be employed to study nuclei far from stability. The irradiation and processing requirements for such an operation, along with the isotope production possibilities, are discussed. Also presented are initial experiments using a ^{148}Gd (t/sub 1/2/ = 75a) target to perform the (p,t) reaction to establish levels in the proposed double magic nucleus ^{146}Gd.

26590 (LA-UR—81-1721) Spectroscopy and mass measurements of neutron rich isotopes by the (t,α) reaction. Flynn, E.R.; Brown, R.E.; Sunier, J.W.; Burke, D.G.; Ajzenberg-Selove, F.; Cizewski, J.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810649—5). NTIS, PC A02/MF A01. Order Number DE81025256.

From 4. international conference on nuclei far from stability; Helsignor, Denmark (7 Jun 1981).

The neutron excess of the triton makes its possible to use this projectile in transfer reactions to reach nuclei of greater neutron excess than the target nucleus. Principal examples of such reactions are the (t,α), (t,p) and (t,^{3}He) reactions, all of which have been used to study neutron rich nuclei. The present report discusses several of these examples and reports on more definitive mass measurements and spectrosopy of the low lying levels of some of these nuclei. In particular, results of using a polarized triton beam are discussed as this study leads to many new spin assignments.

6518 Nuclear Properties And Reactions, A=150-189

REFER ALSO TO CITATION(S) 26575, 26588

6519 Nuclear Properties And Reactions, A=190-219

REFER ALSO TO CITATION(S) 26578

26591 (CONF-801111—48) Threshold photoneutron angular distribution and polarization studies of nuclei. Holt, R.J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023724.

From 6. conference on application of accelerators in research and industry; Denton, TX, USA (Nov 1980).

The photoneutron method was applied to the study of: (1) deuteron photodisintegration; (2) giant magnetic dipole resonances in heavy nuclei; (3) mechanism of radiative capture in light nuclei; and (4) isospin splitting of the giant dipole resonance in ^{60}Ni. These studies were performed with the pulsed bremsstrahlung beam and high-resolution spectrometer available at the Argonne high-current electron linac. A threshold photoneutron polarization method was developed in order to search for the giant M1 resonance in heavy nuclei. A surprisingly small amount of M1 strength was found in ^{208}Pb. Furthermore, the M1 strength for the 5.08-MeV excitation in ^{17}O, the best example of a single-particle M1 resonance in nuclei, was found to be strongly quenched. In addition, the ^{17}O(γ,n$_0$)^{16}O reaction was found to provide an ideal example of the Lane-Lynn theory of radiative capture. The interplay among the three components of the theory, internal, channel and potential capture, were

evident from the data. An electron beam transport system was developed which allows the bremsstrahlung to impinge on the photoneutron target on an axis perpendicular to the usual reaction plane. This system provides an accurate method for the measurement of relative angular distributions in (γ,n) reactions. This system was applied to a high-accuracy measurement of the relative angular distribution for the D(γ,n)H reaction. The question of isospin-splitting of the giant dipole resonance in ^{60}Ni was studied by using the unique pico-pulse from the accelerator and the newly installed 25-m, neutron flight paths. The results provide clear evidence for the effect of isospin splitting.

26592 (CONF-810649—6) Decay of /sup 199m,g/Po: isomeric transitions in ^{199}Po and ^{199}Bi. Bingham, C.R.; Stone, R.E.; Riedinger, L.L.; Lide, R.W.; Carter, H.K.; Mlekodaj, R.L.; Spejewski, E.H. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA); UNISOR, Oak Ridge, TN (USA)). 1981. Contract W-7405-ENG-26;AS05-76ER04936. 4p. NTIS, PC A02/MF A01. Order Number DE81024246.

From 4. international conference on nuclei far from stability; Helsignor, Denmark (7 Jun 1981).

The M4 isomeric transition (E/sub γ/ = 238 keV) of the $13/2^+$ state in ^{199}Po to the $5/2^-$ level, with a half life of 4.17 min, has been observed in mass separated sources. An ~ 72 keV transition in coincidence with the isomeric transition suggests the placement of the $5/2^-$ level above the $3/2^-$, and when combined with α-decay Q values, this results in a placement of the $13/2^+$ isomeric state in ^{195}Pb at ~ 200 keV. The transition rate for the M4 transition in ^{199}Po is similar to those for other M4 transitions in this region. Contrastingly, a M4 transition in ^{199}Bi, which is highly likely to occur on the basis of systematics of $1/2^+$ and 9.2^- states and a sequence of gamma rays among low spin states observed in our data, is highly retarded. Although, this M4 transition is not observable in our data, an upper limit for its strength is established at ~ 1/1000 the intensity of typical M4 transitions in this region. Possible interpretations of this retardation are discussed.

26593 Half-lives of ^{199}Rn and ^{199}Rn/sup m/. Enge, H.A.; Salomaa, M.K.; Sperduto, A.; Schier, W.; Wegner, H.E. (Laboratory for Nuclear Science, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). ACO2-76ER03069. *Physical Review* [*Section*] *C: Nuclear Physics ;* **24**: No. 1, 298-299(Jul 1981).

The nuclide ^{199}Rn and the isomer ^{199}Rn/sup m/ were produced in the reaction ^{169}Tm(^{35}Cl, 5n)^{199}Rn. An electromagnetic velocity filter separated the recoiling residual nuclei from the beam at zero degree. The nuclei were embedded into a surface-barrier detector recording both the arrival pulse and the alpha-decay event. The half-life for ^{199}Rn in its presumed ground state (E/sub α/ = 6.99 MeV) has been determined as 0.5 +- 0.2 sec and the half-life of ^{199}Rm/sup m/ (E/sub α/ = 7.06 MeV) is 0.29 +- 0.05 sec.

26594 Dynamical supersymmetries and single-particle strengths in iridium nuclei. Cizewski, J.A.; Burke, D.G.; Flynn, E.R.; Brown, R.E.; Sunier, J.W. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review Letters ;* **46**: No. 19, 1264-1267(11 May 1981).

We have investigated the reactions /sup 194,196,198/Pt(t,α)/sup 193,195,197/Ir and /sup 191,193/Ir(t,p)/sup 193,195/Ir. While the ^{193}Ir single-particle level structure and two-neutron transfer strengths are not inconsistent with the predictions of the dynamical supersymmetry proposed in this region, /sup 195,197/Ir shown no evidence for the supersymmetry structure.

6520 Nuclear Properties And Reactions, A=220 And Above

26595 (BNL-NCS—51360) Evaluation of ^{232}Th for ENDF/B-V. Bhat, M.R. (Brookhaven National Lab., Upton, NY (USA)). Feb 1981. Contract AC02-76CH00016. 27p. NTIS, PC A03/MF A01. Order Number DE81023980.

The evaluation of neutron and gamma ray production cross sections of ^{232}Th from 10^{-5} eV to 20 MeV is described, and the parts contributed by the author to the evaluation are discussed. All available new data have been included and the procedures used to assess the experimental data and adopt recommended values are described.

26596 (CONF-800979—19) Data interpretation, objective evaluation procedures and mathematical techniques for the evaluation of energy-dependent ratio, shape and cross section data. Poenitz, W.P. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 39p. NTIS, PC A03/MF A01. Order Number DE81023897.

From Workshop on nuclear data evaluation methods and procedures; Upton, NY, USA (22 Sep 1980).

The evaluation of several energy-dependent neutron cross sections which are of importance for practical applications is considered. The evaluation process is defined as the procedure which is used to derive the best knowledge of these cross sections based on the available direct experimental data information, and, using theoretical models, on the auxiliary data base. The experimental data base represents a multiple overdetermination of the unknown cross sections with various correlations between the measured values. Obtaining the least-squares estimator is considered as the standard mathematical procedure to derive a consistent set of evaluated cross section values. Various approximations made in order to avoid the monstrous system of normal equations are considered and the feasibility of the exact solution is demonstrated. The variance-covariance of the result, its reliability and the improvements obtained in iterative steps are discussed. Finally, the inclusion of auxiliary, supplementary information is considered. 45 references.

26597 (CONF-810606—53) Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions. de Saussure, G.; Perez, R.B. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE81023210.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Some problems associated with the measurement and representation of the neutron cross sections of the fertile and fissile nuclei in the resolved and unresolved resonance regions are briefly discussed. Attention is restricted to the heavy nuclei most important for nuclear reactor applications: the resonance structure of the light- and medium-weight nuclei (moderators and structural materials) has different characteristics and requires a different approach. Some of the experimental problems in neutron cross-section measurements and some of the ambiguities in the resonance analysis resulting from the use of different resonance formalisms and different treatments of the effect of far-away levels are discussed. (WHK)

26598 (CONF-810606—68) Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions. de Saussure, G.; Perez, R.B. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 40p. NTIS, PC A02/MF A01. Order Number DE81023184.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Several aspects of the measurement, analysis and evaluation of the cross sections of the fertile and fissile nuclides in the resonance regions are discussed. In the resolved range, for the fertile nuclides it is thought that the principal requirement for improved evaluations is for a practical methodology to deal with systematic errors and their correlations. For the fissile nuclides ^{235}U and ^{239}Pu, the ENDF/B-V evaluations are not consistent with ENDF/B procedures recommendations and fall short of the goals of resonance analysis. New evaluations of these two isotopes should be performed. In the unresolved resonance region it is shown that the ENDF/B representation is ambiguous and is not theoretically justified. A better representation may be desirable, and a validation of the representation with experimental self-shielding and transmission measurements is certainly required. 105 references. (WHK)

26599 Precompound emission of light particles in the reaction ^{16}O+^{238}U at 20 MeV/nucleon. Awes, T.C.; Poggi, G.; Gelbke, C.K.; Back, B.B.; Glagola, B.G.; Breuer, H.; Viola, V.E. Jr. (Cyclotron Laboratory, Michigan State University, East Lansing, Michigan 48824). *Physical Review* [*Section*] *C: Nuclear Physics ;* **24**: No. 1, 89-110(Jul 1981).

Double differential cross sections have been measured for energetic p, d, t, and α particles emitted in reactions of 315 MeV ^{16}O ions on ^{238}U. In coincidence with light-particle emission, the momentum transfer to the target is determined by measuring the folding angle between the two fission fragments resulting from the sequential decay of the target nucleus. It is concluded that the emission of these particles occurs predominantly in fusionlike "central" collisions and at an early stage of the reaction. The energy and angular distributions are described by thermal emission from a source moving with approximately half of the beam velocity. Alternatively, the energy spectra can be explained by emission from a rotating hot spot. The cross sections for d, t, and α emission can be described in terms of a generalized form of the coalescence model which takes into account the Coulomb repulsion from the target nucleus.

26600 **Yields of fission products produced by thermal-neutron fission of ^{249}Cf.** Dickens, J.K.; McConnell, J.W. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). W-7405-ENG-26. *Physical Review* [*Section*] *C: Nuclear Physics ;* **24**: No. 1, 192-205(Jul 1981).

Absolute yields have been determined for 107 gamma rays emitted in the decay of 97 fission products representing 54 mass chains created during thermal-neutron fission of ^{249}Cf. These results include 14 mass chains for which no prior yield data exist. Using a Ge(Li) detector, spectra were obtained of gamma rays emanating from a 0.4 μg sample of ^{249}Cf between 45 s and 0.4 yr after very short irradiations of the ^{249}Cf by thermal neutrons. On the basis of measured gamma-ray yields and known nuclear data, total chain mass yields and relative uncertainties were obtained for 51 masses between 89 and 156. The absolute overall normalization uncertainty is ~8%. The measured A-chain cumulative yields make up 77% of the total light mass (A< or =123) yield and 79% of the total heavy mass yield. The results are compared with fission-product yields previously measured, with generally good agreement. Information on the charge distribution along several isobaric mass chains was obtained by determining fractional yields for 11 fission products and combining these results with other measurements. The charge distribution width parameter for the heavy masses A = 128 to 140 is independent of mass to within the uncertainties of the measurements. For the light masses A = 89 to 112 the charge distribution parameter is also independent of mass but is smaller than for the heavy masses. Total chain yields are in fair agreement with the current evaluation for ^{249}Cf.

6530 Nuclear Theory

26601 **(CONF-800979—18) Neutron strength functions: the link between resolved resonances and the optical model.** Moldauer, P.A. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 17p. NTIS, PC A02/MF A01. Order Number DE81023896.

From Workshop on nuclear data evaluation methods and procedures; Upton, NY, USA (22 Sep 1980).

Neutron strength functions and scattering radii are useful as energy and channel radius independent parameters that characterize neutron scattering resonances and provide a connection between R-matrix resonance analysis and the optical model. The choice of R-matrix channel radii is discussed, as are limitations on the accuracies of strength functions. New definitions of the p-wave strength function and scattering radius are proposed. For light nuclei, where strength functions display optical model energy variations over the resolved resonances, a doubly reduced partial neutron width is introduced for more meaningful statistical analyses of widths. The systematic behavior of strength functions and scattering radii is discussed.

26602 **(DOE/ER/10407—2) Theoretical nuclear structure studies using kaons and alpha particles. Progress report, June 1, 1980-May 31, 1981.** Cotanch, S.R. (North Carolina State Univ., Raleigh (USA). Dept. of Physics). 1981. Contract AS05-79ER10407. 7p. NTIS, PC A02/MF A01.

Theoretical studies of nuclear structure based on K^+-nuclear scattering and proton radiative capture are briefly described. (WHK)

26603 **(IS-M—320) Applications of moment methods to finite nuclei.** Vary, J.P. (Ames Lab., IA (USA)). 1981. Contract W-7405-ENG-82. 9p. (CONF-810107—5). NTIS, PC A02/MF A01. Order Number DE81023788.

From 2. international conference on recent progress in many-body theories; Mexico City, Mexico (12 Jan 1981).

Approaches to a number of many-body problems utilizing moment methods are summarized. Some tests with valence particle systems and some tests with the soluble Lipkin-Meshkov-Glick Hamiltonian are developed in order to assess accuracy of the moment method approach for finite nuclei. Results for the binding energy and for the elastic electron scattering cross sections of ^{16}O using a realistic microscopic no-core effective Hamiltonian are presented.

26604 **Equilibrium statistical treatment of angular momenta associated with collective modes in fission and heavy-ion reactions.** Moretto, L.G. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). pp 365-410 of Physique des ions lourds de 30 MeV par nucleon. Ecole d'ete, Serre-Chevalier, 10-14 sep 1979. Grenoble, France; Universite Scientifique et Medicale (1979).

From Summer school on heavy ion physics at 30 MeV per nucleon; Serre-Chevalier, France (10 Sep 1979).

The angular momentum effects in deep inelastic processes and fission have been studied in the limit of statistical equilibrium. The model consists of two touching liquid drop spheres. Angular momentum fractionation has been found to occur along the mass asymmetry coordinate. If neutron competition is included (i.e., in compound nucleus formation and fission), the fractionation occurs only to a slight degree, while extensive fractionation is predicted if no neutron competition occurs (i.e., in 'fusion-fission' without compound nucleus formation). Thermal fluctuations in the angular momentum are predicted to occur due to degrees of freedom which can bear angular momentum, like wriggling, tilting, bending, and twisting. The coupling of relative motion to one of the wriggling modes, leading to fluctuations between orbital and intrinsic angular momentum, is considered first. Next the effect of the excitation of all the collective modes on the fragment spin is treated. General expressions for the first and second moments of the fragment spins are derived as a function of total angular momentum and the limiting behavior at large and small total angular momentum is examined. Furthermore, the effect of collective mode excitation on the fragment spin alignment is explored and is discussed in light of recent experiments. The relevance of the present study to the measured first and second moments of the γ-ray multiplicities as well as to sequential fission angular ditributions is illustrated by applying the results of the theory to a well studied heavy ion reaction.

26605 **Pauli blocking in the nuclear medium πN transition matrix.** Moniz, E.J.; Sevgen, A. (Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). DE-AC02-76ER03069. *Physical Review* [*Section*] *C: Nuclear Physics ;* **24**: No. 1, 224-230(Jul 1981).

We give an analytic expression for the in-medium nonstatic πN transition matrix in nuclear matter. Pauli blocking and spreading effects are included explicitly. Spin-flip terms are retained. We discuss the modifications of the free-space amplitude as a function of energy and density and show that large dynamical isospin effects are expected in pion scattering on heavy nuclei.

26606 **Random-matrix physics: spectrum and strength fluctuations.** Brody, T.A.; Flores, J.; French, J.B.; Mello, P.A.; Pandey, A.; Wong, S.S.M. (Instituto de Fisica, Universidad Nacional Autonoma de Mexico, Mexico 20, D. F. Mexico). EY-76-5-02-2171. *Reviews of Modern Physics ;* **53**: No. 3, 385-479(Jul 1981).

It now appears that the general nature of the deviations from uniformity in the spectrum of a complicated nucleus is essentially the same in all regions of the spectrum and over the entire Periodic Table. This behavior, moreover, is describable in terms of standard Hamiltonian ensembles which could be generated on the basis of simple information-theory concepts, and which give also a good account of fluctuation phenomena of other kinds and, apparently, in other many-body systems besides nuclei. The main departures from

simple behavior are ascribable to the moderation of the level repulsion by effects due to symmetries and collectivities, for the description of which more complicated ensembles are called for. One purpose of this review is to give a self-contained account of the theory, using methods: sometimes approximate: which are consonant with the usual theory of stochastic processes. Another purpose is to give a proper foundation for the use of ensemble theory, to make clear the origin of the simplicities in the observable fluctuations, and to derive other general fluctuation results. In comparing theory and experiment, the authors give an analysis of much of the nuclear-energy-level data, as well as an extended discussion of observable effects in nuclear transitions and reactions and in the low-temperature thermodynamics of aggregates of small metallic particles.

26607 Mesonic processes in deep-inelastic electron scattering from nuclei. Van Orden, J.W.; Donnelly, T.W. (Institute of Theoretical Physics, Department of Physics, Stanford University, Stanford, California 94305). DE-AC02-76ER03069;DE-AS05-76-ER05126-A003. *Annals of Physics (New York)*; **131**: No. 2, 451-493(Feb 1981).

Inelastic electron scattering is considered in the energy and momentum transfer region associated with the quasielastic and 3—3 resonance pion electroproduction peaks. Calculations of two-nucleon ejection via two-body meson-exchange currents (MEC) and of pion electroproduction from threshold through the 3—3 resonance are presented using the Fermi gas model of the nucleus. The MEC contribution is found to be significant in this region, and helps to account for the discrepancy between theory and experiment in the "dip" between the quasielastic and 3—3 resonance peaks.

6540 Radiation And Shielding Physics

26608 (BNL—28332) Neutron scattering measurements of low-temperature hydrogen tunneling in niobium. Wipf, H.; Magerl, A.; Shapiro, S.M.; Satija, S.K.; Thomlinson, W. (Brookhaven National Lab., Upton, NY (USA); National Bureau of Standards, Washington, DC (USA); Muenchen Univ. (Germany, F.R.)). 1981. Contract AC02-76CH00016. 9p. (CONF-810497—2). NTIS, PC A02/MF A01. Order Number DE81025095.

From International symposium on metalhydrogen systems; Miami Beach, FL, USA (13 Apr 1981).

Low-temperature (0.09 K and 5 K) neutron spectroscopic measurements are presented demonstrating the existence of H tunneling states for O-H pairs in $NbO_{0.013}H_{0.016}$. From the results, a tunneling matrix element of (0.19 +- 0.04) meV, and an estimate for the strain-induced interaction between different O-H pairs are obtained. These experiments are the first neutron scattering measurements showing H tunneling in a metal. They contribute to an understanding of H diffusion, for which tunneling is considered to play an important role.

26609 (LA-UR—81-1712) Photoemission measurements for low energy x-ray detector applications. Day, R.H. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 16p. (CONF-8106108—1). NTIS, PC A02/MF A01. Order Number DE81025255.

From Low energy X-ray conference; Monterey, CA, USA (Jun 1981).

Photoemission has been studied for nearly 100 years as both a means of investigating quantum physics, and as a practical technique for transducing optical/x-ray photons into electrical currents. Numerous x-ray detection schemes, such as streak cameras and x-ray sensitive diodes, exploit this process because of its simplicity, adaptability, and speed. Recent emphasis on diagnostics for low temperature, high density, and short-lived, plasmas for inertial confinement fusion has stimulated interest in x-ray photoemission in the sub-kilovolt regime. In this paper, a review of x-ray photoemission measurements in the 50 eV to 10 keV x-ray region is given and the experimental techniques are reviewed. A semiempirical model of x-ray photoemission is discussed and compared to experimental measurements. Finally, examples of absolutely calibrated instruments are shown.

26610 (ORNL/TM—7818) Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV. Alsmiller, R.G. Jr.; Barish, J. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 23p. NTIS, PC A02/MF A01. Order Number DE81024418.

Multigroup cross sections (66 neutron groups and 21 gamma ray groups) are described for neutron energies from thermal to 400 MeV. The elements considered are hydrogen, ^{10}B, ^{11}B, carbon, nitrogen, oxygen, sodium, magnesium, aluminum, silicon, sulfur, potassium, calcium, chromium, iron, nickel, tungsten and lead. These cross sections are available from the Radiation Shielding Information Center of the Oak Ridge National Laboratory. 19 references.

26611 Linear transport in nonhomogeneous media. Larsen, E.W. (Theoretical Division, University of California, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). W-7405-ENG.36. *Journal of Mathematical Physics (New York)*; **22**: No. 7, 1463-1466(Jul 1981).

A set of elementary solutions of the linear transport equation is constructed for a class of scattering ratios which vary continuously in space. These solutions are shown to be complete on the half-range $0<\mu<$ or $=1$ for a restricted class of scattering ratios.

6550 Medical Physics

REFER ALSO TO CITATION(S) 25610

26612 (ORNL/TM—7748) Reference dosimetry for various Health Physics Research Reactor spectra. Sims, C.S.; Killough, G.G. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 68p. NTIS, PC A04/MF A01. Order Number DE81025851.

Reference neutron dosimetry is developed in a consistent and reproducible manner for five different Health Physics Research Reactor (HPRR) spectra: the unshielded HPRR, the HPRR shielded by 20-cm concrete, by 12-cm Lucite, by 13-m steel, and by a 5-cm steel/15-cm concrete shield. The reference dosimetry is presented in two forms so as to be of maximum usefulness both to dosimetrists and to reactor operations personnel. The forms are: (1) dosimetric data (i.e., wet tissue kerma, element 57 dose, and element 57 dose equivalent) per unit fluence at 3 m from the centerline of the HPRR, and (2) dosimetric data at 3 m from the centerline of the HPRR per fission in the reactor. A large amount of HPRR dosimetry-related information are included and form a comprehensive compilation of available data. These data include calculated HPRR neutron energy spectra for each of the five above mentioned shielding situations, dosimetric data per unit fluence as a function of neutron energy, dosimetric contributions to the total reference values by neutron energy group, quality factors, shield attenuation factors and a summary of nuclear engineering data for each shield, kerma variation with distance from the HPRR, and a summary of previously published reference dosimetry-related HPRR data.

6560 Solid State Physics

REFER ALSO TO CITATION(S) 25945

26613 (CONF-800765—9) Energies of <110> coincidence twist boundaries, stacking faults, and free surfaces in metal oxides with NaCl structure. Wolf, D. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01. Order Number DE81023113.

From 7. LLR/MMRD international symposium of interfaces in glass-metal systems; Berkeley, CA, USA (28 Jul 1980).

A computer code developed for the determination of energies and structures of coincidence twist boundaries, stacking faults, and free surfaces is applied to MgO and NiO for which the energies of such <110> interfaces and the free surface are determined starting from empirical ionic central potentials.

26614 (SAND—80-2694C) Method for fast pulsed thermal diffusivity measurements in thin films. Benson, D.A.; Miller, G.D. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 24p. (CONF-810683—3). NTIS, PC A02/MF A01. Order Number DE81023747.

From International joint conference on thermophysical properties; Gaithersburg, MD, USA (15 Jun 1981).

A modification of the pulse heating technique for thermal diffusivity measurements is described for use with thin vapor deposited coatings. This method uses a capacitive storage pulsed power system to resistively heat thin substrates in a 20 microsecond time interval to temperatures within the 1000 to 3000°K range. The rapid heating allows not only the study of thin coatings, but also allows data unperturbed by sample changes to be collected on materials which experience gradual restructuring or mass loss at high temperatures. Samples in this work are prepared as vapor deposited films on the substrate before the test. These films, with high-electrical resistivity relative to the substrate, are heated primarily by thermal diffusion after the electrical pulse. This diffusion is observed by a fast infrared optical pyrometer system imaged on the coating surface. The observed surface temperature behavior is then compared to solutions of the heat transfer equations in which the thermal diffusivity is parametrically adjusted to match the experimental profiles. A family of such experiments for Sc and ScD/sub x/ films ranging from 5 to 10 microns thick are discussed and compared with previous thermal diffusivity data. The present work extends to temperatures well above previous measurements for these materials.

26615 (UCRL—85288) Theoretical studies of shock dynamics in two-dimensional structures. V. Microscopic constraints on shock-induced signals. Karo, A.M.; Walker, F.E.; Cunningham, W.G.; Hardy, J.R. (Lawrence Livermore National Lab., CA (USA); Nebraska Univ., Lincoln (USA)). 18 Jun 1981. Contract W-7405-ENG-48. 14p. (CONF-810684—17). NTIS, PC A02/MF A01. Order Number DE81024194.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Molecular dynamics calculations are presented that address the extent of microscopic detail that can be deduced from macroscopic gauge measurements of shock propagation in condensed systems. Large asymmetrically shock-loaded lattices were simulated, varying the initial temperature and the strength of shock loading. Randomly-placed mass defects were introduced into the lattice, and the degradation of the shock front with the subsequent development of fracture and chunky spall were studied and compared with the coherent microscopic spall found for perfect lattices.

26616 Semiclassical image potential at a solid surface. Echenique, P.M.; Ritchie, R.H.; Barberan, N.; Inkson, J. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). W-7405-ENG-26. *Physical Review [Section] B: Condensed Matter ;* **23**: No. 12, 6486-6493(15 Jun 1981).

A surface dielectric function of a semi-infinite plane-bounded metal is defined in the spirit of the plasmon-pole dielectric function of the bulk. It is modeled in such a way that the surface-plasmon dispersion relation is recovered for small momentum transfer. This function is employed to compute the image potential at all distances outside the surface. Interaction with bulk modes is neglected for simplicity and clarity. The interaction of a massive point charge with a metal surface is also considered in the context of a boson model for surface-plasmon excitation. We present a new definition of the image potential for this case.

26617 Fluctuations and freezing in a one-dimensional liquid: Hg/sub 3-δ/AsF_6. Axe, J.D. (Brookhaven National Lab., Upton, NY). Contract EY-76-C-02-0016. pp 399-414 of Ordering in strongly fluctuating condensed matter systems. Riste, T. (ed.). New York, NY; Plenum Publishing Corp. (1980).

The mercury chain compound Hg/sub 3-δ/AsF_6 consists of an ordered body-centered tetragonal (bct) lattice of AsF_6^- anions (the host lattice) through which pass linear chains of polymercury cations arranged in two identical perpendicular nonintersecting arrays, one parallel to a vector/sub L/, the other b vector/sub L/. Room temperature diffraction studies have shown in addition to the expected Bragg reflections, strong diffuse scattering arranged into series of thin sheets in reciprocal space. It is established that the diffuse sheets arise from the Hg-atoms and the narrow width of the sheets shows that the intrachain Hg-Hg distance, d, is well defined, and the nearly uniform distribution of intensity within a sheet shows that there is little or no interference between scattering from different chains. Thus positions of the atoms along the chains are virtually uncorrelated from one chain to the next. A simple model developed and analyzed by Emery and Axe for Hg/sub 3-δ/AsF_6 is discussed. It incorporates competing parallel and perpendicular chain interactions, predicts correctly the long range order and clarifies the apparent failure of the system to anticipate this ordering in the fluctuations above T/sub c/. In addition, it treats carefully the effects of one-dimensional fluctuations, and predicts that the Hg chains at high temperatures behave as a one-dimensional liquid. The subsequent phase transformation can be thought of as a freezing of the 1-d Hgliquid, and can be discussed in terms of self-consistent solutions of the sine-Gordon Hamiltonian. (WHK)

6561 Superconductivity

REFER ALSO TO CITATION(S) 25896, 25922

26618 (CONF-800561—4) Vortex unbinding in superconducting thin films. Bancel, P.A.; Gray, K.E. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 5p. NTIS, PC A02/MF A01. Order Number DE81023540.

From International conference on ordering in two dimensions; Lake Geneva, WI, USA (28 May 1980).

The study of the origin of broad resistive transitions in 2D superconducting films requires extremely homogeneous samples. Granular aluminum evaporated onto freshly eleaved mica substrates are shown to satisfy this criterion. Values of T/sub c/, as a function of resistance per square, are in agreement with a one parameter model of independent grains coupled by the Josephson effect, and not the predictions of the Kosterlitz-Thouless vortex unbinding model.

26619 Effect of structural fluctuations on depth of penetration of longitudinal electric field into a superconducting film. Gogadze, G.A.; Kulik, I.O. (Physicotechnical Institute of Low Temperatures, Academy of Sciences of the Ukrainian SSR). *Soviet Journal of Low Temperature Physics (English Translation) ;* **6**: No. 9, 587-589(Sep 1980).

A consideration of scattering of quasi-particles by static inhomogeneities of the order parameter (structural fluctuations) leads to a temperature-independent depth of penetration of a longitudinal electric field into a thin superconducting film.

6570 Theoretical Physics

REFER ALSO TO CITATION(S) 26475, 26522

26620 (SAND—81-1065) Sandia technology, Volume 5, No. 4. (Sandia National Labs., Albuquerque, NM (USA)). Jul 1981. Contract AC04-76DP00789. 30p. NTIS, PC A03/MF A01. Order Number DE81025118.

General information is presented on three subject areas. A computer code is described for calculating thermodynamic equilibrium phase diagrams allowing rapid evaluation of the feasibility of producing specific thin-film coatings by chemical vapor deposition. Dynamic fracture in oil shale, in which mathematical models of rock fracture show promise in predicting rock breakage from preparatory blasting for in situ oil retorting. Finally, criteria have been developed for designing atomic artillery shells to follow the same trajectories as conventional shells, allowing both types of shells to be used more effectively. (GHT)

26621 Errors in the Wigner approach to quantum dynamics. Heller, E.J.; Brown, R.C. (Department of Chemistry, University of California, Los Angeles, California 90024). *Journal of Chemical Physics, The ;* **75**: No. 2, 1048-1050(15 Jul 1981).

It is shown that the recent results and error trends of Lee and Scully and Brown and Heller are explicable in terms of the "dangerous cross term" analysis. Extended quantum state suffer larger errors in the Wigner method.(AIP)

26622 Periodic wavelength dispersion in a scanning UV monochromator. DeSerio, R. (Argonne National Laboratory, Argonne, Illinois 60439). *Applied Optics ;* **20**: No. 10, 1781-1784(15 May 1981).

An analysis has been made of some wavelength dispersion problems associated with the McPherson model 225 1-m VUV scanning monochromator. The measurements show a periodic error in the dispersion of such a monochromator, refocussed for a fast-ion beam light source. They indicate a wavelength error from this source of up to +- 0.1 A with a period of 25 A, this latter corresponding to one rotation of the grating drive screw.

26623 Uniformly redundant arrays: digital reconstruction methods. Fenimore, E.E.; Cannon, T.M. (University of California, Los Alamos Scientific Laboratory, P.O. Box 1663, Los Alamos, New Mexico 87545). *Applied Optics ;* **20**: No. 10, 1858-1865(15 May 1981).

Several new digital reconstruction techniques for coded aperture imaging are developed which are especially applicable to uniformly redundant arrays (URAs). The techniques provide improved resolution without upsetting the artifact-free nature of URAs. Two new techniques are described; one which allows self-supporting URAs and one which avoids (or at least mitigates) a blur which has been associated with previous correlation analyses. Each of the methods and their resolution improvements are demonstrated with reconstructions of a laser-driven compression. Particular emphasis has been placed on the special sampling required of the encoded picture and the decoding function if artifacts are to be avoided. For large URAs, it is shown that another new digital technique, periodic decoding, is much faster. Periodic decoding does produce artifacts, but they usually are negligible.

26624 Some heat engine cycles in which liquids can work. Allen, P.C.; Paulson, D.N.; Wheatley, J.C. (Univ. of California, San Diego). Contract DE-AT03-76ER70143. *Proceedings of the National Academy of Sciences of the United States of America ;* **78**: No. 1, 31-35(Jan 1981).

Liquids can work in heat engine cycles that employ regeneration. Four such cycles are discussed: Stirling, Malone, Stirling-Malone, and Brayton. Both regeneration and the role of the second thermodynamic medium are treated, and the principles are verified by quantitative measurements with propylene in a Stirling-Malone cycle.

26625 Direct time-domain techniques for transient radiation and scattering from wires. Miller, E.K. (Lawrence Livermore Lab., CA); Landt, J.A. Contract W-7405-ENG-48. *Proceedings of the IEEE (Institute of Electrical and Electronics Engineers) ;* **68**: No. 11, 1396-1423(Nov 1980).

This is a tutorial introduction to transient electromagnetics, focusing on direct time-domain techniques. We examine physical, mathematical, numerical and experimental aspects of time-domain methods, with emphasis on wire objects excited as antennas or scatterers. Numerous computed examples illustrate the characteristics of direct time-domain procedures, especially where they may offer advantages over the more familiar frequency-domain techniques. These advantages include greater solution efficiency for many types of problems, the ability to handle nonlinearities, improved physical insight and interpretability, availability of wide-band information from a single calculation, and the possibility of isolating interactions among various parts of an object using time-range gating. 47 references.

6580 Mathematical Physics

26626 (CONF-8007106—1) Hyperparamodulation: a refinement of paramodulation. Wos, L.; Overbeek, R.; Henschen, L. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 17p. NTIS, PC A02/MF A01. Order Number DE81023533.

From 5. conference on automated deduction; Savoi, France (8 Jul 1980).

A refinement of paramodulation, called hyperparamodulation, is the focus of attention in this paper. Clauses obtained by the use of this inference rule are in effect the result of a sequence of paramodulations into one common nucleus. Among the interesting properties of hyperparamodulation are: first, clauses are chosen from among the input and designated as nuclei or into clauses for paramodulation; second, terms in the nucleus are starred to restrict the domain of generalized equality substitution; third, total control is thus iteratively established over all possible targets for paramodulation during the entire run of the theorem-proving program; and fourth, application of demodulation is suspended until the hyperparamodulation completes. In contrast to these four properties which are reminiscent of the spirit of hyper-resolution, the following differences exist: first, the nucleus and the starred terms therein, which are analogous to negative literals, are determined by the user rather than by syntax; second, rather than restricting the choice of nucleus to mixed clauses, any input clause can be designated as a nucleus; and third, while hyper-resolution requires inferred clauses to be positive, no corresponding requirement exists for clauses inferred by hyperparamodulation.

26627 (UCID—19062) Adaptive-mesh zoning by the equipotential method. Winslow, A.M. (Lawrence Livermore National Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 11p. NTIS, PC A02/MF A01.

An adaptive mesh method is proposed for the numerical solution of differential equations which causes the mesh lines to move closer together in regions where higher resolution in some physical quantity T is desired. A coefficient $D > 0$ is introduced into the equipotential zoning equations, where D depends on the gradient of T . The equations are inverted, leading to nonlinear elliptic equations for the mesh coordinates with source terms which depend on the gradient of D. A functional form of D is proposed.

70 FUSION ENERGY

7001 Plasma Research

26628 (CONF-801011—97) Lower-hybrid heating and current drive system for the STARFIRE tokamak. Ehst, D.A.; Boley, C.D.; Evans, K. Jr.; Fuja, R.; Jung, J.; Trachsel, C.A.; Hino, T. (Argonne National Lab., IL (USA); McDonnell Douglas Astronautics Co., St. Louis, MO (USA); General Atomic Co., San Diego, CA (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023845.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

STARFIRE is a commercial tokamak reactor which is designed to operate in a purely steady-state mode with the electron current maintained by momentum transfer from lower-hybrid waves launched from end-fire waveguide arrays. The rf system has been designed for consistency with plasma physics constraints, and its components have been selected with the goal of minimizing the electric power required to maintain the plasma current. The system has been analyzed in the thermal, electrical, magnetic, and radiative environments of reactor operation and appears to provide reliable, low-maintenance performance.

26629 (CONF-810606—40) Analysis of the ORNL radiation-streaming integral experiments. Santoro, R.T.; Alsmiller, R.G. Jr.; Barnes, J.M.; Chapman, G.T.; Tang, J.S. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE81024907.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The determination of radiation streaming through the various penetrations that will be present in the blanket and shield of a D-T burning fusion reactor is one of the more complicated problems facing nuclear design engineer. Penetrations of varying size and shape will be required for neutral particle injection, rf heating, vacuum pumping, and plasma diagnostics. The radiation streaming

through these openings will degrade the reactor performance by the adverse effects of nuclear heating, induced activation, and radiation damage in vital components. The effects of radiation streaming must be estimated during the design of the reactor. Measurements have been made to determine the streaming of ~ 14-MeV neutrons through a simple iron duct imbedded in a concrete shield.

26630 (CONF-810606—46) Neutron and gamma-ray streaming calculations for the ETF neutral-beam injectors. Lillie, R.A.; Santoro, R.T.; Alsmiller, R.G. Jr.; Barnes, J.M. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE81023016.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The tritium plasma of the Engineering Test Facility (ETF) fusion reactor will be heated and ignited by the injection of neutral deuterium. Since the deuterons must be injected through straight ducts into the plasma, the neutron and secondary gamma radiation produced as a result of the D-T reactions will stream directly into the neutral beam injectors and lead to adverse effects in vital components. The radiation leaking through the injection ports will be comprised of ~ 14 MeV neutrons (from the D-T reactions) plus a low-energy neutron and secondary gamma ray distribution that results from the interactions of the energetic neutrons with the plasma liner and the primary shielding about the torus. In this paper two-dimensional radiation transport calculations carried out to estimate the effects on the injector components of radiation streaming through the injection duct will be described and the results of these calculations will be presented and discussed.

26631 (DOE/ET/53025—T8) Collisional processes of interest in MFE plasma research. Progress report No. 4, April 1, 1981-May 31, 1981. Olson, R.E. (SRI International, Menlo Park, CA (USA)). 29 May 1981. Contract AT03-76ET53025. 3p. NTIS, PC A02/MF A01.

Research on this contract can be divided into two general topics: (1) H^- formation collision processes, and (2) the determination of scattering cross sections used to diagnose plasma properties. Research progress during the last two months is presented.

26632 (DOE/ET/53041—13) Computer simulation of kinetic properties of plasmas. Progress report, July 1, 1980-May 31, 1981. Denavit, J. (Northwestern Univ., Evanston, IL (USA)). 1981. Contract AS02-76ET53041. 9p. (COO—2200-13). NTIS, PC A02/MF A01. Order Number DE81024935.

The research is directed toward the development and testing of new numerical methods for particle and hybrid simulation of plasmas, and their application to physical problems of current significance to Magnetic Fusion Energy. During the present period, research on the project has been concerned with the following specific problems: (A) numerical study of non-local trapped-electron modes; (B) particle diffusion due to stochastic orbits in sheared magnetic fields; (C) time-filtering particle simulations with large time steps; (D) non-random initializations of particle codes; and (E) computer studies of field-reversed ion rings.

26633 (LA—8784-MS) Internal resistive initiation coil electromagnetics in the FED/INTOR baseline design. Vogel, H.F.; Bronner, G.; Murray, J.G. (Los Alamos National Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 15p. NTIS, PC A02/MF A01.

This study determined some of the electric requirements for radio-frequency nonassisted plasma initiation from normal conducting coils inside tokamak toroidal field coils in the presence of cryostats and other major structures. We also studied the effects of bellows or highly insulated sections. Depending on whether or not insulating sections are used, the field penetration time is 50 to 90 ms, the blip pulse length is 0.15 to 0.19 s, and the power supplied to the blip coils is 400 to 700 MW. Because of its plasma stabilizing effect, a highly conducting vacuum shell is recommended.

26634 (LA—8828-MS) Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear. Jacobson, A.R. (Los Alamos National Lab., NM (USA)). Apr 1981. Contract W-7405-ENG-36. 16p. NTIS, PC A02/MF A01.

A laser diagnostic scheme is described which facilitates localization of density fluctuations along the line of sight. The method exploits both the generally observed anisotropy of density fluctuations in low-beta plasmas, as well as the twisting of the magnetic field which occurs across the minor diameter of reversed-field pinches, spheromaks, etc. Both interferometric and schlieren variations are discussed.

26635 (LA-UR—81-1601) Pulse power applications of flux compression generators. Fowler, C.M.; Caird, R.S.; Erickson, D.J.; Freeman, B.L. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810659—5). NTIS, PC A02/MF A01.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

Characteristics are presented for two different types of explosive driven flux compression generators and a megavolt pulse transformer. Status reports are given for rail gun and plasma focus programs for which the generators serve as power sources.

26636 (LA-UR—81-1611) Epoxy replication for Wolter x-ray microscope fabrication. Priedhorsky, W. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 3p. (CONF-810651—1). NTIS, PC A02/MF A01.

From 1981 topical conference on low-energy X-ray diagnostics; Livermore, CA, USA (8 Jun 1981).

An epoxy replica of a test piece designed to simulate a Wolter x-ray microscope geometry showed no loss of x-ray reflectivity or resolution, compared to the original. The test piece was a diamond-turned cone with 1.5° half angle. A flat was fly-cut on one side, then super- and conventionally polished. The replica was separated at the 1.5°-draft angle, simulating a shallow angle Wolter microscope geometry. A test with 8.34 A x rays at 0.9° grazing angle showed a reflectivity of 67% for the replica flat surface, and 70% for the original. No spread of the reflected beam was observed with a 20-arc second wide test beam. This test verifies the epoxy replication technique for production of Wolter x-ray microscopes.

26637 (ORNL/TM—7733) Nonlinear analysis of disruptions in the JIPP T-II tokamak. Hicks, H.R.; Holmes, J.A.; Lynch, V.E.; Carreras, B.A. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01. Order Number DE81025854.

A comparison is made between results of the profile control experiments on the JIPP T-II tokamak and those of the time evolution of tearing modes. Over a wide range of conditions, nonlinear initial-value tearing mode calculations are considered with experimental results. In particular, the time scale of soft disruptions, as reflected in the negative voltage spikes, given by the tearing mode analysis agrees with that obtained experimentally.

26638 (PPPL—1773) Microchannel plate response to high-energy neutrons. Persing, R.; Medley, S.S. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1981. Contract AM02-76CH03073. 38p. NTIS, PC A03/MF A01.

The response of a chevron microchannel plate (MCP) to high energy neutrons was measured. The large area (4.6 cm x 13 cm) multi-anode MCP performance characteristics in the saturated pulse counting mode of operation were examined prior to neutron testing. This established a linear operating regime in which the neutron detection efficiency was measured to be 0.17% for 2.5 MeV-DD neutrons and 0.64% for 14 MeV-DT neutrons. The higher response measured for the 14 MeV-DT neutrons is attributed to gamma ray contamination induced by neutron collisions with materials located between the neutron source and the MCP detector. Due to their lower energy, the 2.5 MeV-DD response measurements are expected to be relatively free of gamma contamination and, hence, indicative of actual response of the MCP detector to neutrons in the 1 to 10 MeV energy range.

26639 (PPPL—1787) Ideal MHD beta-limits of poloidally asymmetric equilibria. Todd, A.M.M.; Miller, A.E.; Grimm, R.C.; Okabayashi, M.; Dalhed, H.E. Jr. (Princeton Univ., NJ (USA). Plasma Physics Lab.; Grumman Aerospace Corp., Princeton, NJ (USA)). May 1981. Contract AM02-76CH03073. 28p. NTIS, PC A03/MF A01. Order Number DE81024074.

The ideal MHD stability of poloidally asymmetric equilibria, which are typical of a tokamak reactor design with a single-null poloidal divertor is examined. As with symmetric equilibria, stability to non-axisymmetric modes improves with increasing triangularity and ellipticity, and with lower edge safety factor. Pressure profiles optimized with respect to ballooning stability are obtained for an asymmetric shape, resulting in β/sub critical/ $\simeq$ 5.7%. The corresponding value for an equivalent symmetric shape is β/sub critical/ $\simeq$ 6.5%.

26640 (PPPL—1788) Hamiltonian field description of the one-dimensional Poisson-Vlasov equations. Morrison, P.J. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1981. Contract AM02-76CH03073. 14p. NTIS, PC A02/MF A01. Order Number DE81023974.

The one-dimensional Poisson-Vlasov equations are cast into Hamiltonian form. A Poisson Bracket in terms of the phase space density, as sole dynamical variable, is presented. This Poisson bracket is not of the usual form, but possesses the commutator properties of antisymmetry, bilinearity, and nonassociativity by virtue of the Jacobi requirement. Clebsch potentials are seen to yield a conventional (canonical) formulation. This formulation is discretized by expansion in terms of an arbitrary complete set of basis functions. In particular, a wave field representation is obtained.

26641 (PPPL—1789) Confinement of high energy trapped particles in tokamaks. Goldston, R.J.; White, R.B.; Boozer, A.H. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Apr 1981. Contract AM02-76CH03073. 9p. NTIS, PC A02/MF A01. Order Number DE81023149.

The banana orbits of high energy trapped particles in tokamaks are found to diffuse rapidly in the radial direction if the toroidal ripple exceeds a low critical value. During this diffusion the energy, the magnetic moment, and the value of the magnetic field strength at the banana tips are conserved.

26642 (PPPL—1804) Transport and isomorphic equilibria. Boozer, A.H. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1981. Contract AM02-76CH03073. 18p. NTIS, PC A02/MF A01. Order Number DE81023962.

It is shown that large classes of plasma equilibria can have identical drift orbits and associated transport. Such equilibria are named isomorphic. In particular, the neoclassical transport coefficients are given for all equilibria in which the magnetic field strength depends on one helicity.

26643 (PPPL-Q—38) Annual report, October 1, 1979-September 30, 1980. (Princeton Univ., NJ (USA). Plasma Physics Lab.). May 1981. Contract AM02-76CH03073. 95p. NTIS, PC A05/MF A01.

This annual report covers research progress on each of the following areas: (1) PLT device, (2) PDX, (3) spheromak, (4) smaller devices, (5) theory, (6) TFTR, (7) applied physics, (8) TFTR blanket module experiments, (9) advanced toroidal facility, (10) advanced projects design and analysis, (11) engineering, and (12) fabrication, operations and maintenance. (MOW)

26644 (UCRL—52981) Large-acceptance-angle gridded analyzers in an axial magnetic field. Molvik, A.W. (Lawrence Livermore National Lab., CA (USA)). 1 Jun 1981. Contract W-7405-ENG-48. 42p. NTIS, PC A03/MF A01. Order Number DE81025122.

Electrostatic retarding-potential gridded analyzers have been used to measure the current and the axial energy distributions of ions escaping along magnetic field lines in the 2XIIB magnetic mirror fusion experiment at Lawerence Livermore National Laboratory (LLNL). Three analyzers are discussed: a large scanning analyzer with a movable entrance aperture that can measure ion or electron losses from a different segment of the plasma diameter on each shot, a smaller analyzer that mounts in 5-cm-diam ports, and a multicollector analyzer that can continuously measure losses from the entire plasma diameter.

26645 (UCRL—85826) Electron-cyclotron-resonant-heated electron distribution functions. Matsuda, Y.; Nevins, W.M.; Cohen, R.H. (Lawrence Livermore National Lab., CA (USA)). 26 Jun 1981. Contract W-7405-ENG-48. 17p. (CONF-810512—1). NTIS, PC A02/MF A01. Order Number DE81024415.

From Workshop on EBT stability theory; Oak Ridge, TN, USA (13 May 1981).

Recent studies at Lawrence Livermore National Laboratory (LLNL) with a bounce-averaged Fokker-Planck code indicate that the energetic electron tail formed by electron-cyclotron resonant heating (ECRH) at the second harmonic is not Maxwellian. We present the results of our bounce-averaged Fokker-Planck code along with some simple analytic models of hot-electron distribution functions.

26646 Scaling studies in field reversal experiments. Lipson, J.; Armstrong, W.T.; Cochrane, J.C.; McKenna, K.F.; Sherwood, E.G.; Tuszewski, M.; Hamasaki, S. (Los Alamos National Laboratory, Los Alamos New Mexico 87545). W-7405-ENG. 36. *Applied Physics Letters ;* **39**: No. 1, 43-45(1 Jul 1981).

The stable period of field-reversed configurations, defined by the onset of the rotational n = 2 instability, is observed to scale with R^2/ rho/sub i/ over a new, wider range of experimental conditions, where R is the major radius and rho/sub i/ is the ion gyroradius indexed to the external field. The scaling factor is approximately 6.0 x 10^{-7} sec cm^{-1} over a range of R^2/ rho/sub i/ from 18 to ~100 cm in which 1/ rho/sub i/ varied from 1 to 5 cm^{-1} and R varied by approximately 30%. In a complimentary study, the stable period was observed to be independent of T/sub i/ over a range of 200—1200 eV when R^2/ rho/sub i/ was held approximately constant. The theoretical correlation of the stable period with the particle containment time, and hence with R^2/ rho/sub i/, are discussed.

26647 Ponderomotive effects in collisionless plasma: A Lie transform approach. Cary, J.R.; Kaufman, A.N. (Department of Physics and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Physics of Fluids ;* **24**: No. 7, 1238-1250(Jul 1981).

A new method for the kinetic analysis of ponderomotive effects in collisionless plasma is presented. This method involves the application of the Lie-transform perturbation technique to the Hamiltonian formulation of the Vlasov equation. Basically, a new system, in which the high frequency oscillations are absent, is found. In this system the distribution function evolves according to a ponderomotive Hamiltonian, which is the kinetic generalization of the ponderomotive potential. It is shown that the ponderomotive Hamiltonian can easily be determined from the well-known linear susceptibility. This formalism is used to calculate several new results. Among these results are the general formula for the quasistatic density perturbation produced by a hot magnetoplasma wave, a generalization of previous formulas for the laser-generated quasistatic magnetic field, and the general formula for the ponderomotive gyrofrequency shift produced by an electromagnetic wave propagating at an arbitrary angle.

26648 Collisional drift waves in a plasma with electron temperature inhomogeneity. Drake, J.F.; Hassam, A.B. (Department of Physics and Astronomy, University of Maryland, College Park, Mayland 20742). *Physics of Fluids ;* **24**: No. 7, 1262-1269(Jul 1981).

A fluid theory of collisional electrostatic drift waves in a plasma slab with magnetic shear is presented. Both electron temperature and density gradients are included. The equations are solved analytically in all relevant regions of the parameter space defined by the magnetic shear strength and the perpendicular wavelength and explicit expressions for the growth rates are given. For shear strengths appropriate for present-day tokamak discharges the temperature gradient produces potential wells which localize the mode in the electron resistive region, well inside the ion sound

turning points. Mode stability arises from a competition between the destabilizing influence of the time dependent thermal force and the stabilizing influence of electron energy dissipation. Convective energy loss is not important for shear parameters of present-day fusion devices.

26649 Drift modes in axisymmetric tandem mirrors. Horton, W. Jr. (Institute for Fusion Studies and the Department of Physics, The University of Texas of Austin, Austin, Texas 78712). *Physics of Fluids ;* **24**: No. 7, 1270-1278(Jul 1981).

The drift mode analysis of the tandem mirror is developed for a large aspect ratio, axisymmetric model of the equilibrium. The axial drift wave eigenmodes are shown to change character as the plasma pressure varies with respect to the inverse aspect ratio. In the high beta regime the drift modes are transformed into a finite frequency convective cell and the flute-like ion drift wave. Quasi-linear formulas are given for the anomalous radial losses.

26650 Finite Larmor radius theory of resistive instabilities. Mondt, J.P. (Los Alamos National Laboratory, University of California, Los Alamos, New Mexico 87545). *Physics of Fluids ;* **24**: No. 7, 1279-1288(Jul 1981).

The hybrid-kinetic model, previously used to investigate stability properties of collisionless high-beta plasmas characterized by finite ion gyroradius, is generalized to include the effects of finite resistivity and gravitation (to simulate toroidal field curvature). Possible applications of the present formalism include investigations of finite ion Larmor radius effects on the stability of screw-pinch and tokamak equilibria against ideal and resistive interchange instabilities as well as tearing modes. A simple example of such an application is carried out for the case of local slow resistive interchange modes within the context of a near-theta-pinch ordering.

26651 Finite ion Larmor radius stabilization of m = 1 modes of a high-β screw pinch. Cayton, T.E.; Freidberg, J.P. (Los Alamos National Laboratory, University of California, Los Alamos, New Mexico 87545). *Physics of Fluids ;* **24**: No. 7, 1289-1291(Jul 1981).

In the near θ-pinch limit, a radially diffuse high-β screw pinch may be rendered completely stable through a combination of finite ion Larmor radius effects and wall effects.

26652 Interaction of lower hybrid wave fields with drift-cyclotron loss-cone instability. Shaing, K. (Fusion Engineering Program, Department of Nuclear Engineering, University of Wisconsin, Madison, Wisconsin 53706). *Physics of Fluids ;* **24**: No. 7, 1292-1298(Jul 1981).

The dispersion relation for the drift-cyclotron loss-cone mode in the presence of the lower hybrid wave is calculated using both electrostatic and finite β models. It is found that lower hybrid wave fields with frequency ω_0 can stabilize the mode if $\omega/\text{sub l/h} < \omega_0 < \omega/\text{sub +/}$, or $\omega_0 < \omega/\text{sub -/} < \omega/\text{sub l/h}$, where $\omega/\text{sub l/h} = \omega/\text{sub p/i/}(1+\omega^2/\text{sub p/e/}\omega^2/\text{sub c/e)/sup 1/2/}$, $\omega/\text{sub plus-or-minus/} = [\ +\text{- A}+(\text{A}^2+4\omega^2/\text{sub l/h)/sup 1/2/]/2}$, and $\text{A} = \omega^2/\text{sub l/h}\epsilon/\omega/\text{sub c/ik}$. If the plasma β is greater than a critical value $\beta/\text{sub c/}$, there is another stabilization region, namely, $\omega_0 > \delta\omega/\text{sub l/h}$, where δ is a numerical constant. Even though the stabilization effect is small in this region, the lower hybrid wave frequency for electron heating should be in this region in order to avoid enhancing the particle loss rate.

26653 Effects of the fast wave on the drift-cyclotron loss-cone mode. Shaing, K. (Fusion Engineering Program, Department of Nuclear Engineering, University of Wisconsin, Madison, Wisconsin 53706). ET-79-5-02-5125. *Physics of Fluids ;* **24**: No. 7, 1299-1302(Jul 1981).

Particle orbits in the presence of the fast wave fields are calculated. It is found that the resonant interaction of ions with the wave can be neglected at $\omega_0 = 2\omega/\text{sub c/i}$, provided that the wave electric field strength is less than a critical value $\text{E/sub c/}(= 4\text{k/sub parallel/T/e})$. The dominant effect on the dispersion relation of the drift-cyclotron loss-cone mode is thus found to be due to the nonresonant effects of the wave on electrons and ions. It is found that a fast wave with $\omega_0 = 2\omega/\text{sub c/i}$ destabilizes the mode. For $\omega_0 < 2\omega/\text{sub c/i}$, fast waves can stabilize the mode for certain values of the plasma β, which is calculated numerically.

26654 Analytic solution for a weakly rotating, collisionless z pinch. Maxon, S. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). W-7505-ENG-48. *Physics of Fluids ;* **24**: No. 7, 1310-1313(Jul 1981).

The system of time independent Vlasov and Maxwell's equation is solved for a cylindrically symmetric z pinch including weak rotation of both electrons and ions. The solution clearly shows the effect of rotation on the density profile and azimuthal magnetic field. Limitations on the rotation frequency and radius are found by insisting on self consistency of the approximation scheme.

26655 Kinetic effects on ballooning modes in mirror machines. Tang, W.M.; Catto, P.J. (Plasma Research Institute, Science Applications, Inc., Boulder, Colorado 80302). DE-AC03-79-ET-53057. *Physics of Fluids ;* **24**: No. 7, 1314-1319(Jul 1981).

A general procedure for examining the influence of kinetic effects on the stability of magnetohydrodynamic ballooning modes in mirror machines is presented. In particular, the basic kinetic ballooning mode equation for a nonaxisymmetric, arbitrary beta system with anisotropic pressure is derived. Considering a long-thin equilibrium typical of the tandem mirror, it is shown that this governing eigenmode equation reduces to a simple form independent of wave-particle resonant effects.

26656 Viscous plasma flow in a multiple-mirror configuration. Bravenec, R.V.; Lichtenberg, A.J.; Lieberman, M.A.; Berk, H.L. (Department of Electrical Engineering and Computer Sciences). DE-AS03-76F00034;DE-AT0E-76ET53059. *Physics of Fluids ;* **24**: No. 7, 1320-1325(Jul 1981).

The steady-state, axial plasma confinement by a multiple-mirror device is studied in the "viscous fluid regime," $\lambda/\text{l/sub m/} << 1$ (but not negligible), where λ is the ion-ion mean-free-path and l/sub m/ is the scale length of magnetic field variations. An approximate analytical solution is obtained by averaging over the rapid variations caused by the individual mirrors and compared to a numerical solution without averaging. A smooth transition is found, with increasing values of $\lambda/\text{l/sub m/}$, from sonic flow to a diffusive flow. Studies are made of the variation in density profiles and confinement times versus $\lambda/\text{l/sub m/}$, mirror ratio, relative mirror width, and number of mirror cells. The viscous fluid regime is found to have the same characteristics as the ideal multiple-mirror regime for $\lambda/\text{l/sub m/} \rightarrow 1$.

26657 Analytic equilibria with quadrupole symmetry in the paraxial limit. Pearlstein, L.D.; Kaiser, T.B.; Newcomb, W.A. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). W-7405-ENG-48. *Physics of Fluids ;* **24**: No. 7, 1326-1335(Jul 1981).

Mirror equilibria for arbitrary mirror ratio and flux-tube eccentricity are obtained to leading order in the plasma pressure (beta expansion) in the paraxial limit (axial scale lengths long compared with radial scale lengths). The solutions are given in terms of quadratures over known functions. The theory is applied to a tandem-mirror configuration.

26658 Anomalous toroidal field penetration in Tormac V. Feinberg, B.; Vaucher, B.G.; Shaw, R.S.; Vella, M.C. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Physics of Fluids ;* **24**: No. 7, 1342-1347(Jul 1981).

Magnetic field penetration into a cool, collisional, magnetized plasma has been investigated in Tormac V. Magnetic probe and laser interferometer studies reveal anomalous penetration of the applied toroidal field into a plasma with an initial parallel bias toroidal field. The applied poloidal field, however, formed a well-defined magnetic front which was effective at sweeping up particles. Strong shear in the vacuum magnetic field does not inhibit the apparent decoupling of the applied toroidal field from the applied poloidal field.

26659 Tokamak microturbulence and the second law of thermodynamics. Boozer, A.H. (Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08544). DE-AC02-76-CH03073. *Physics of Fluids ;* **24**: No. 7, 1382-1383(Jul 1981).

The second law of thermodynamics is shown to place interesting limits on fluctuation amplitudes and on the form of interaction of the turbulence with the plasma in large tokamaks.

26660 Diffusion of magnetic field into an expanding plasma shell. Hussey, T.W.; Roderick, N.F. (Division 4247, Target Interaction Theory, Sandia Laboratories, Albuquerque, New Mexico 87185). DE-AC04-76-DP00789. *Physics of Fluids ;* **24**: No. 7, 1384-1385(Jul 1981).

A simple theory is developed to describe the density profile of an electromagnetically imploded hollow plasma liner. The model gives a good analytic means of determing density gradient scale length and sheath thickness for use in linear and nonlinear analysis of the Rayleigh—Taylor instability.

26661 Long-wavelength magnetohydrodynamic stability of the field reversed theta pinch. Barnes, D.C.; Anderson, D.V. (Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review Letters ;* **46**: No. 20, 1337-1340(18 May 1981).

The ideal magnetohydrodynamic equilibrium and stability of a field-reversed theta pinch is investigated. Elongated, scalar pressure equilibria with no toroidal field are generated by a two-dimensional equilibrium code. Their stability is investigated in three-dimensional nonlinear magnetohydrodynamic simulations. Experimental equilibria and stability properties are reproduced.

26662 Absorpton and hot-electron production for 1.05 and 0.53 μm light on spherical targets. Slater, D.C.; Busch, G.E.; Charatis, G.; Johnson, R.R.; Mayer, F.J.; Schroeder, R.J.; Simpson, J.D.; Sullivan, D.; Tarvin, J.A.; Thomas, C.E. (KMS Fusion, Inc., Ann Arbor, Michigan 48106). DE-AC08-78OP40030. *Physical Review Letters ;* **46**: No. 18, 1199-1202(4 May 1981).

Laser-plasma interaction experiments have been performed with both 1.05- and 0.53-μm-wavelength light incident on spherical glass targets. Comparisons of hard x-ray spectra and fast ion energy imply a substantial reduction of hot-electron levels at the shorter wavelength. Increased absorbed-energy fractions at the shorter wavelength are in agreement with the expected scaling of inverse bremsstrahlung absorption.

26663 (UCRL-Trans—11689) Critical analysis of the electron gyrorelaxation heating device in the AMBAL facility. Vekshtein, G.E.; Gaponov, V.A. (Lawrence Berkeley Lab., CA (USA)). 18 Apr 1981. Translated from Preprint No. 80-144. 14p. NTIS, PC A02/MF A01.

The AMBAL facility currently under construction at the Institute of Nuclear Physics, Siberian Branch, USSR Academy of Sciences, is designed for experimental testing of the idea of suppressing plasma losses along the magnetic field by means of ambipolar electric fields. Such ambipolar plasma traps are systems of three magnetic mirror cells connected by end faces. The effect of electron temperature variations on plasma heating is theoretically analyzed.

26664 Magnetic confinement of fusion plasmas. Lasche, G.P. (MS. Physics, and MS, Nuclear Engineering, Massachusetts Institute of Technology). *Physics Teacher ;* **19**: No. 4, 234-244(Apr 1981).

Starting with the Lorentz force law, the basic physics involved in magnetic confinement in thermonuclear reactors is reviewed. Among the topics covered are magnetic bottles, tokamaks, tandem mirrors, and energy balance considerations.(AIP)

26665 Expeditions Vlasov solver for computation of ion extraction from a plasma. Whealton, J.H. (Fusion Energy Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). W-7405-ENG-26. *Journal of Computational Physics ;* **40**: No. 2, 491-496(Apr 1981).

An efficient algorithm is presented for iterative solution to the Vlasov and Poisson-Vlasov equations. Flow diagrams are given. (AIP)

26666 Beta limits for torsatrons. Bauer, F. (New York Univ., NY); Betancourt, O.; Garabedian, P.; Shohet, J.L. Contract AC02-76ER03077;AS02-78ET53082. *Proceedings of the National Academy of Sciences of the United States of America ;* **78**: No. 1, 1-3(Jan 1981).

An ideal magnetohydrodynamic equilibrium and stability code is used to study ballooning modes in torsatrons. The most dangerous modes turn out to be those with low poloidal and toroidal wave numbers. Beta limits for equilibrium and stability are determined for an $l = 2$ ultimate torsatron with large $l = 1$ and $l = 3$ sidebands.

7002 Fusion Power Plant Technology

REFER ALSO TO CITATION(S) 25902, 26022, 26636, 26652, 26660

26667 (CONF-800707—26) STARFIRE: a conceptual design of a commercial tokamak power plant. Paper IAEA-CN-39/E-1. Abdou, M.A.; Baker, C.C.; DeFreece, D.; Trachsel, C.; Graumann, D.; Kokoszenski, J. (Argonne National Lab., IL (USA); McDonnell Douglas Astronautics Co., St. Louis, MO (USA); General Atomic Co., San Diego, CA (USA); Parsons (Ralph M.) Co., Pasadena, CA (USA)). 1980. Contract W-31-109-ENG-38. 17p. NTIS, PC A02/MF A01. Order Number DE81023528.

From 8. international conference on plasma physics and controlled nuclear fusion research; Brussels, Belgium (1 Jul 1980).

STARFIRE is a conceptual design for a commercial tokamak power plant based on the deuterium/tritium/lithium fuel cycle. The emphasis of the study is on the simplicity of the engineering design, maintainability, lower electricity cost, and improved safety and environmental features. The reactor has a 7-m major radius and produces 1200 MW of electric power. STARFIRE operates in a steady-state mode with the plasma current driven by a lower hybrid rf system. The plasma purity control and exhaust system is based on the limiter/vacuum concept, which offers unique advantages for commercial power reactors. The blanket utilizes a solid lithium compound for tritium breeding and pressurized water as the coolant.

26668 (CONF-800740—28) Argonne's program in heavy-ion fusion. Martin, R.L.; Arnold, R.; Burke, R.; Watson, J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023529.

From 11. international conference on high energy accelerators; Geneva, Switzerland (7 Jul 1980).

Argonne is constructing the initial part of a xenon accelerator which could serve as the driver for an Inertial Confinement Fusion power plant. The project consists of a Xe source, a 1.5 Mv Dynamitron preaccelerator, independently phased rf cavities as a low β linac, and Wideroe linac at 12.5 and 25 MHz. The beam will be injected at 220 MeV into a circular ring to its space charge limit, transferred to a second ring for multiturn injection after an x-y rotation, extracted, compressed in time duration, transported and focused onto foil targets. The project thus will demonstrate nearly all of the beam manipulations involved in a full scale ICF driver. The feasibility of accelerating in the accumulator ring to 10 GeV to achieve adequate beam energy to permit energy deposition experiments in hot plasma is being studied. The status and future plans of this project are discussed.

26669 (CONF-800950—20) Steady-state tokamak reactor with non-divertor impurity control: STARFIRE. Baker, C.C. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023831.

From 11. symposium on fusion technology; Oxford, UK (15 Sep 1980).

STARFIRE is a conceptual design study of a commercial tokamak fusion electric power plant. Particular emphasis has been placed on simplifying the reactor concept by developing design

concepts to produce a steady-state tokamak with non-divertor impurity control and helium ash removal. The concepts of plasma current drive using lower hybrid rf waves and a limiter/vacuum system for reactor applications are described.

26670 (CONF-801011—85) Importance of shield design in minimizing radioactive-material inventory in tokamaks. Jung, J.; Abdou, M. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01. Order Number DE81023917.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

An optimization study is carried out for the outboard bulk shielding of the STARFIRE reactor. The optimization criteria used include: (1) reactor accessibility shortly after shutdown; (2) minimization of high-level long-term induced activation; and (3) radiation protection of reactor components. It is shown that with a 1.1 m-thick shield, the biological dose inside the reactor room decreases to ~ 1.5 mrem/h within 24 h after shutdown. It is also shown that more than 90% of the total mass of the radioactive material inventory in STARFIRE has a high potential for recycling within 30 to 50 yr after component replacement or reactor decommissioning.

26671 (CONF-801011—86) Starfire poloidal coil systems. Evans, K. Jr.; Kim, S.H.; Turner, L.R.; Wang, S.T. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023717.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The poloidal coils for STARFIRE consists of three systems: (1) equilibrium field (EF) coils; (2) ohmic heating (OH) coils; and (3) correction field (CF) coils. The EF coils are superconducting and lie outside the toroidal field (TF) coils. These coils provide the bulk of the equilibrium field necessary to keep the plasma positioned in the vacuum chamber with the desired cross sectional shape and pressure and current distributions. Having these coils outside of the TF coils requires that they have a larger stored energy and larger currents but eases the assembly, maintenance, and reliability of the coils. The STARFIRE OH system is relatively small compared to tokamaks in which the current is entirely ohmically driven. It is designed to provide sufficient flux in the early startup to raise the plasma current to the point (1 to 2 MA) where the rf current drive can take over.

26672 (CONF-801011—87) Choice of coolant in commercial tokamak power plants. Abdou, M.A.; Graumann, D. (Argonne National Lab., IL (USA); General Atomic Co., San Diego, CA (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023716.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The STARFIRE design study focused on solid tritium breeder blankets in order to minimize the stored chemical energy. The most suitable coolant candidates with solid tritium breeders are water and helium. This paper presents the results of a comparative study of the two coolants. The study shows clear advantages for the choice of pressurized water for the conditions of the STARFIRE tokamak power plant design. The study also identifies those areas where development is required in order to utilize the potential advantages of helium.

26673 (CONF-801011—88) Tritium-handling considerations for ETF and STARFIRE. Finn, P.A.; Clemmer, R.G. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 14p. NTIS, PC A02/MF A01. Order Number DE81023910.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The tritium handling requirements for both the ETF and the STARFIRE fusion reactor designs are analyzed. The use of a limiter/vacuum system for STARFIRE produced a high fractional burnup (0.42) which resulted in a low tritium inventory in the fueling system. The importance of a fast process flow rate is achieving a rapid cleanup after a tritium release is demonstrated; another important factor is the rate at which HTO is released from building surfaces. A complete fusion reactor tritium facility is described.

26674 (CONF-801011—89) STARFIRE burn cycle. Brooks, J.N.; Boley, C.D.; Driemeyer, D. (Argonne National Lab., IL (USA); McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023708.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The STARFIRE burn cycle differs substantially from pulsed reactor burn cycles. The startup and shutdown periods are considerably longer, and the power supply requirements considerably smaller, than for pulsed operation. Plasma initiation is accomplished with electron cyclotron resonance heating, to eliminate the problems of high voltage coils. During the main burn the plasma is thermally stabilized by the addition of trace quantities of iodine, which serve to radiate most of the alpha heating energy. The burn cycle is compatible with lower hybrid current drive operation.

26675 (CONF-801011—90) Analysis of in-situ tritium recovery from solid fusion-reactor blankets. Smith, D.L.; Clemmer, R.G.; Jankus, V.Z.; Rest, J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01. Order Number DE81023919.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The proposed concept for in-situ tritium recovery from the STARFIRE blanket involves circulation of a low pressure (~ 0.05 MPa) helium through formed channels in the highly porous solid breeding material. Tritium generated within the grains must diffuse to the grain boundaries, migrate through the grain boundaries to the particle surface and then percolate through the packed bed to the helium purge channel. Highly porous α-$LiAlO_2$ with a bimodal pore distribution is proposed for the breeding material to facilitate the tritium release.

26676 (CONF-801011—91) Electromagnetic effects involving a tokamak reactor first wall and blanket. Turner, L.R.; Evans, K. Jr.; Gelbard, E.; Prater, R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01. Order Number DE81023719.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

Four electromagnetic effects experienced by the first wall and blanket of a tokamak reactor are considered. First, the first wall provides reduction of the growth rate of vertical axisymmetric instability and stabilization of low mode number interval kink modes. Second, if a rapid plasma disruption occurs, a current will be induced on the first wall, tending to maintain the field formerly produced by the plasma. Third, correction of plasma movement can begin on a time scale much faster than the L/R time of the first wall and blanket. Fourth, field changes, especially those from plasma disruption or from rapid discharge of a toroidal field coil, can cause substantial eddy current forces on elements of the first wall and blanket. These effects are considered specifically for the first wall and blanket of the STARFIRE commercial reactor design study.

26677 (CONF-801011—92) Development of tritium breeding blankets for DT-burning fusion reactors. Clemmer, R.G. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01. Order Number DE81023904.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

This study examines the status of understanding of blanket tritium recovery and the performance of potentially viable tritium breeding materials under conditions anticipated in a DT-fueled fusion reactor environment. The existing physicochemical, thermophysical, and ceramographic data for candidate liquid and solid breeders are reviewed and appropriate operating conditions defined. It is shown that selection of a breeding material and an appropriate tritium recovery method can impose significant constraints upon blanket design, particularly when considerations of breeder/coolant/structure compatibility and temperature limitations are taken into account.

26678 (CONF-801011—93) Implications of the DD fuel cycle on tokamak reactor technology considerations. Baker, C.C.; Brooks, J.N.; Ehst, D.A.; Evans, K. Jr.; Jung, J.; Mattas, R.; Misra, B.; Smith, D.L.; Stevens, H.C.; Turner, L.R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 14p. NTIS, PC A02/MF A01. Order Number DE81023712.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The initial results of a study to develop a conceptual design of a DD tokamak reactor are reported in this paper. A comprehensive steady-state power and particle balance code has been used to survey a variety of design points. A reference set of parameters (R_o = 8.6 m, B/sub max/ = 14 T, β = 11%, P/sub th/ = 2500 to 2700 MW) has been selected for further study. The concepts of rf driven currents and a limiter-vacuum system have been examined and appear to offer promise. However, the penalty of rf current drive, in terms of recirculating power, is relatively larger for DD than for DT reactors. Blanket engineering studies have emphasized the optimization of energy multiplication and inboard blanket thickness.

26679 (CONF-801011—94) Overview of the STARFIRE reference commercial tokamak fusion power reactor design. Baker, C.C.; Abdou, M.A.; DeFreece, D.A.; Trachsel, C.A.; Graumann, D.; Barry, K. (Argonne National Lab., IL (USA); McDonnell Douglas Astronautics Co., St. Louis, MO (USA); General Atomic Co., San Diego, CA (USA); Parsons (Ralph M.) Co., Pasadena, CA (USA)). 1980. Contract W-31-109-ENG-38. 16p. NTIS, PC A02/MF A01. Order Number DE81023912.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The purpose of the STARFIRE study is to develop a design concept for a commercial tokamak fusion electric power plant based on the deuterium/tritium/lithium fuel cycle. The major features for STARFIRE include a steady-state operating mode based on a continuous rf lower-hybrid current drive and auxiliary heating, solid tritium breeder material, pressurized water cooling, limiter/vacuum system for impurity control and exhaust, high tritium burnup, superconducting EF coils outside the TF superconducting coils, fully remote maintenance, and a low-activation shield.

26680 (CONF-801011—95) First-wall/blanket materials selection for STARFIRE tokamak reactor. Smith, D.L.; Mattas, R.F.; Clemmer, R.G.; Davis, J.W. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 22p. NTIS, PC A02/MF A01. Order Number DE81023915.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The development of the reference STARFIRE first-wall/blanket design involved numerous trade-offs in the materials selection process for the breeding material, coolant structure, neutron multiplier, and reflector. The major parameters and properties that impact materials selection and design criteria are reviewed.

26681 (CONF-801011—96) Limiter/vacuum system for plasma impurity control and exhaust in tokamaks. Abdou, M.; Brooks, J.; Mattas, R. (Argonne National Lab., IL (USA); McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). 1980. Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01. Order Number DE81023843.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

A detailed design of a limiter/vacuum system for plasma impurity control and exhaust has been developed for the STARFIRE tokamak power plant. It is shown that the limiter/vacuum concept is a very attractive option for power reactors. It is relatively simple and inexpensive and deserves serious experimental verification.

26682 (CONF-801011—98) Neutronic optimization of solid breeder blankets for STARFIRE design. Gohar, Y.; Abdou, M.A. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 16p. NTIS, PC A02/MF A01. Order Number DE81023914.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

Extensive neutronic tradeoff studies were carried out to define and optimize the neutronic performance of the different solid breeder options for the STARFIRE blanket design. A set of criteria were employed to select the potential blanket materials. The basic criteria include the neutronic performance, tritium-release characteristics, material compatibility, and chemical stability. Three blanket options were analyzed. The first option is based on separate zones for each basic blanket function where the neutron multiplier is kept in a separate zone. The second option is a heterogeneous blanket type with two tritium breeder zones. In the first zone the tritium breeder is assembled in a neutron multiplier matrix behind the first wall while the second zone has a neutron moderator matrix instead of the neutron multiplier. The third blanket option is similar to the second concept except the tritium breeder and the neutron multiplier form a homogeneous mixture.

26683 (CONF-801011—99) In-situ maintenance of low-Z limiters in reactors. Norem, J.H. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023913.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

In a reactor environment, the surface of a limiter or wall is primarily determined by the mechanism of erosion and deposition of surface material. It should be possible to use pellet injection to reduce net erosion to zero everywhere if low-Z materials are used for the surface. Erosion rates can, in general, be minimized by large area limiters and high plasma temperatures, which transmit power to the walls with less sputtering. Under ideal steady state conditions the wall surface is dominated by metallurgical effects in the wall.

26684 (CONF-801011—100) First-wall, blanket, and shield engineering test program for magnetically confined fusion power reactors. Maroni, V.A. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 15p. NTIS, PC A02/MF A01. Order Number DE81023911.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The key engineering areas identified for early study relate to FW/B/S system thermal-hydraulics, thermomechnics, nucleonics, electromagnetics, assembly, maintenance, and repair. Programmatic guidance derived frm planning exercises involving over thirty organizations (laboratories, industries, and universities) has indicated (1) that meaningful near term engineering testing should be feasible within the bounds of a modest funding base, (2) that there are existing facilities and expertise which can be profitably utilized in this testing, and (3) that near term efforts should focus on the measurement of engineering data and the verification/calibration of predictive methods for anticipated normal operational and transient FW/B/S conditions. The remainder of this paper discusses in more detail the planning strategies, proposed approach to near term testing, and longer range needs for integrated FW/B/S test facilities.

26685 (CONF-801011—101) Economic 5-megajoule heavy-ion driver for mid-term fusion goals. Martin, R.L.; Arnold, R.C.; Burke, R.J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023849.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

Design concepts for heavy-ion drivers with lower costs are presented which are adapted to the needs of ICF development in the next decade, rather than power plants. Four 5-MJ drivers are compared, whose repetition rates range from 0.5 Hz to 20 Hz. Three use synchrotrons, and their costs are estimated to be competitive with any other existing driver technology.

26686 (CONF-801011—103) Safety of superconducting magnets for fusion: thermal and electromagnetic effects of rapid TF coil discharge. Turner, L.R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023844.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

The most rapid discharge of a TF coil caused from a discontinuity of current path, as might result from the burning of a current lead or the failure of an internal or external conductor joint.

The discontinuity will cause a sudden very high voltage and arcing, not only where the discontinuity occurred, but at several other points in the system as well. The subsequent discharge of the TF coil will depend on the effective electrical resistance of the arcs. The consequences of a sudden resistive voltage drop of 20 kV (0.83Ω for a 24 kA current) have been investigated.

26687 (CONF-810141—(Absts)) Alternate fusion fuels workshop. (Department of Energy, Washington, DC (USA). Office of Energy Research). Jun 1981. 34p. NTIS, PC A03/MF A01. Order Number DE81024017.

From Alternate fusion fuels workshop; Germantown, MD, USA (26 Jan 1981).

The workshop was organized to focus on a specific confinement scheme: the tokamak. The workshop was divided into two parts: systems and physics. The topics discussed in the systems session were narrowly focused on systems and engineering considerations in the tokamak geometry. The workshop participants reviewed the status of system studies, trade-offs between d-t and d-d based reactors and engineering problems associated with the design of a high-temperature, high-field reactor utilizing advanced fuels. In the physics session issues were discussed dealing with high-beta stability, synchrotron losses and transport in alternate fuel systems. The agenda for the workshop is attached.

26688 (CONF-810654—2) Quality-assurance approach for the Elmo Bumpy Torus Proof-of-Principal experiment. Sticksel, F.M. (Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.; McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). 1981. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE81023224.

From IEA Tokamak quality assurance workshop; Princeton, NJ, USA (2 Jun 1981).

Components, subsystems and systems will be subjected to inspection and test as necessary to ensure compliance to applicable specifications, Acceptance Test Procedures and/or customer requirements. Quality Assurance will inspect each component, subsystem and system for selected mechanical and electrical defects. In addition, Quality Assurance will either perform, or verify performance of, and analyze, or verify analysis of, all required field and laboratory tests. If hardware is modified, repaired or replaced after final testing, necessary re-inspection and retest must be performed. Insofar as possible the component, subsystem or system will be released as acceptable upon completion of these activities. When nonconformances are detected during the course of site surveillance activities, MDAC or Gilbert/Commonwealth will initiate a Nonconformance Record for review by MDAC Quality Assurance and Project Engineering personnel. These nonconformances will be identified and dispositioned per MDAC Standard Practices with the advice and concurrence of Gilbert/Commonwealth personnel, if deemed appropriate. MDAC Quality Assurance personnel will witness the pre-operational testing and review the test data.

26689 (DOE/DP/40052—T1) Deformable mirror study. Final report, 21 July 1980-15 May 1981. Budgor, A.B. (Rockwell International Corp., Canoga Park, CA (USA). Rocketdyne Div.). Mar 1981. Contract AC08-78DP40052. 164p. NTIS, PC A08/MF A01.

The beam quality of a baseline system similar to the Helios system at Los Alamos Scientific Laboratory was analyzed with a two-dimensional beam train code based on a Fresnel propagator. The other components of the code include: (a) characterization of phase aberrations either in terms of Zernike polynomials synthesized directly from optical component interferograms when available, or by constructing a random wave front with specified statistics; (b) non-diffractive linear amplification via the Frantz-Nodvik equations; and (c) correction of accumulated phase aberration with continuous deformable mirrors whose surface is modeled by bicubic splines through the actuator points. The technical contents of this report will be presented in 4 sections. Section II will describe the physical optics of beam train propagation. A heuristic physical argument defining the zeroth order efficacy of adaptive optics to correct phase aberration is then derived. The results of applying the diffraction computer code to one beam line of the Helios laser system are described. The wave length scalability of deformable mirrors and efficacy of deformable mirror adaptive optics to correct phase aberration at UV wave lengths are then described.

26690 (DOE/DP/40086—1(Vol.1)) Inertial-confinement fusion central-station electric-power-generating plant. Final report, March 1, 1979-September 30, 1980. Sucov, E.W. (ed.). (Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.). 27 Feb 1981. Contract AC08-79DP40086. 294p. NTIS, PC A13/MF A01. Order Number DE81024498.

This report contains a complete description of the subsystems of the power plant including driver, driver power supply, pellet fabrication, pellet injection and aiming, data handling and control, evacuation, tritium and radwaste handling, first wall protection, first wall and structure, heat removal, tritium breeding and neutron shielding, maintenance and repair and balance of plant. In addition, it contains analytic support for the conceptual designs developed for each subsystem. The emphasis of the effort was on designing a viable reactor cavity and on solving the problems of interfacing the driver systems with the reactor cavity. The reactors generate 3500 MWt by irradiating a pellet whose gain is 175 from two opposite sides with a total of 2 MJ driver energy at a 10 Hz repetition rate. Because the nominal laser driver efficiency is 10% and that for the heavy ion driver is 30%, the net electric power outputs are 1207 MWe and 1346 MWe; the net plant conversion efficiencies are 28.1% and 31.3%; and the recirculating fractions are 22.9% and 14.0% respectively. The increased power output is, however, only one of the factors considered by utilities in performing a cost minimization analysis of competing power sources for system expansion. These other factors include: capital costs, cost of construction time, operating costs, environmental and licensing costs and reliability cost.

26691 (DOE/DP/40086—1(Vol.2)) Inertial-confinement fusion central-station electric-power-generating plant. Final report, March 1, 1979-September 30, 1980. Sucov, E.W. (ed.). (Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.). 27 Feb 1981. Contract AC08-79DP40086. 339p. NTIS, PC A17/MF A01. Order Number DE81024494.

This report contains a complete description of the subsystems of the power plant including driver, driver power supply, pellet fabrication, pellet injection and aiming, data handling and control, evacuation, tritium and radwaste handling, first wall protection, first wall and structure, heat removal, tritium breeding and neutron shielding, maintenance and repair and balance of plant. In addition, it contains analytic support for the conceptual designs developed for each subsystem. The emphasis of the effort was on designing a viable reactor cavity and on solving the problems of interfacing the driver systems with the reactor cavity. The reactors generate 3500 NWt by irradiating a pellet whose gain is 175 from two opposite sides with a total of 2 MJ driver energy at a 10 Hz repetition rate. Because the nominal laser driver efficiency is 10% and that for the heavy ion driver is 30%, the net electric power outputs are 1207 MWe and 1346 MWe; the net plant conversion efficiencies are 28.1% and 31.3%; and the recirculating fractions are 22.9% and 14.0% respectively. The increased power output is, however, only one of the factors considered by utilities in performing a cost minimization analysis of competing power sources for system expansion. These other factors include: capital costs, cost of construction time, operating costs, environmental and licensing costs and reliability cost.

26692 (DOE/ER/10107—2) Functional requirements for fusion reactor first walls. Status report No. MITNRL-002. Meyer, J.E.; Adegbulugbe, A.O. (Massachusetts Inst. of Tech., Cambridge (USA)). Mar 1980. Contract AS02-78ER10107. 49p. NTIS, PC A03/MF A01. Order Number DE81023233.

Information about first walls in existing fusion reactor conceptual designs has been gathered, organized, and tabulated. The information includes geometrical arrangements, material selections, and operating conditions (temperature, pressure, radiation, and cyclic parameters). The tabulated information is supplemented by text and equations that indicate important features and relations to structural design concepts.

26693 (GA-A—14847) Permissible-limit and flaw-size determination in an experimental fusion-reactor component. Sweig, R.A.; Reis, E.E.; Trester, P.W. (General Atomic Co., San Diego, CA (USA)). Feb 1981. Contract AT03-80SF11512. 69p. NTIS, PC A04/MF A01. Order Number DE81025223.

The disposition of defective alloy 155 copper plate stock and Doublet III B-coil machined center post components required applied fracture mechanics. Based on predicted B-coil center post fatigue loads, the change in material fatigue behavior caused by various flaw types was established. A fracture mechanics model was used to determine the flaw size vs fatigue life relationship. Then, flaw size tolerance at various fatigue load levels was ascertained. Intentionally induced cracks were studied to determine the effect of natural flaws on material fatigue behavior, and advanced nondestructive examination techniques were developed to estimate flaw dimensions. Flaws were located and characterized, and detailed stress analyses performed to determine the equivalent alternating stress at each flaw location. Flaw size and flaw size tolerance for a particular load were compared to determine the serviceability of each defective component. Fatigue study results showing flaw size vs fatigue life are presented, and copper microstructure and flaw structure are reviewed. Nondestructive testing methods to determine the location and size of flaws are described, and component service requirements and stress analysis methods are discussed.

26694 (LA—8753MS) Internal magnetic probe data from ZT-40. Burkhardt, L.C.; Phillips, J.A. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 23p. NTIS, PC A02/MF A01. Order Number DE81024051.

Measurements of magnetic field distribution as a function of time and radius were made in ZT-40 with its ceramic vacuum vessel. Data were obtained with a 10-station, 20-coil magnetic probe, measuring the B/sub p/ and B/sub ϕ/ orthogonal field components in deuterium plasma discharges. Sheath formation and diffusion, magnetic axis location and motion, the effect of the probe on the plasma, and the consistency of flux measurements with external probes are examined.

26695 (LA—8829-MS) Superconducting solenoid designed for 400 kJ at 25 kA under conditions of fast discharge and field reversal. Weldon, D.; Chowdhuri, P.; Honig, M.; Rogers, J.D.; Thullen, P. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 13p. NTIS, PC A02/MF A01. Order Number DE81024057.

A 1.26-mH superconducting solenoid made of NbTi and Cu-CuNi mixed matrix superconductor was designed and fabricated by Westinghouse Electric Corporation for the Los Alamos National Laboratory as part of the pulsed energy storage coil program. The coil was designed to store 400 kJ at a current of 25 kA and has been operated to currents of 20 kA. Development of high current cables and low-loss superconductors are both necessary undertakings for future fusion devices. The first tests of the coil involved a very slow charge of the coil followed by a rapid discharge in 1.07 ms with a capacitor bank and a normal-conductor load coil in a resonant L-C-L circuit. The second test consisted of a slow charge followed by a discharge and recharge on a time scale of a few seconds. This latter cycle resembles that expected in a tokamak induction coil. Loss measurements were made by an electrical method during the second series of tests.

26696 (LA-UR—81-1395) Design and fabrication of a high-damage threshold infrared Smattt interferometer. Hammond, R.B.; Gibbs, A.J. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810429—27). NTIS, PC A02/MF A01.

From Conference on optics; Santa Fe, NM, USA (6 Apr 1981).

It has been shown that a Smartt interferometer may be used as a very precise alignment tool for infrared lasers. This interferometer may also be used effectively to investigate the phase front of a laser pulse. To use this tool for applications to high-power, fast-pulse laser systems such as Helios and Antares; however, it has been necessary to fabricate a structure with the unique optical characteristics of the Smartt interferometer combined with a very high optical-damage threshold. We have been successful in this effort by utilizing the high technology, process control, and unique properties of semiconductor-grade, single-crystal Si.

26697 (LA-UR—81-1416) Development of a quality-assurance program for the Tritium Systems Test Assembly. Minor, R.C. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 13p. (CONF-810654—1). NTIS, PC A02/MF A01.

From IEA Tokamak quality assurance workshop; Princeton, NJ, USA (2 Jun 1981).

A quality assurance program was developed for TSTA with the attempt in mind to satisfy the developmental nature of the project. Numerous reviews replace strict guidelines because guidelines are one of the objectives of the project, not a basis for it. The reviews assure adequate technical consideration and avoid unilateral decisions. Other major requirements of the program plan include interfacing with another quality assurance organization, the assignment of responsibilities, and instructions for the preparation of SDD's. Areas of concern are, in general, budget related, and include receiving inspection and acceptance of items. A software program is only now being established.

26698 (LA-UR—81-1566) Influences on target irradiation symmetry in CO_2 laser-fusion experiments. Carman, R.L. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 28p. (CONF-810576—1). NTIS, PC A03/MF A01.

From Topical conference on symmetry aspects of inertial fusion implosions; Washington, DC, USA (27 May 1981).

The existence of very steep density profiles and high upper shelf densities imply that the CO_2 laser deposits its energy spatially quite close to the ablation surface where calculations indicate that a high degree of symmetry must exist in order to achieve the necessary high compression ratios. Thus, energy transport provides only limited improvement in the ablative symmetry over that achieved in the irradiation symmetry. Current data suggests that a balance between radiation pressure and hydrodynamic pressure underestimates the density to which the CO_2 laser light penetrates for early times.

26699 (LA-UR—81-1641) 10-joule high-voltage trigger micro Marx. Platts, D.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-26. 3p. (CONF-810561—1). NTIS, PC A02/MF A01.

From 3. IEE international pulsed power conference; Albuquerque, NM, USA (31 May 1981).

A low energy Marx generator makes a convenient trigger for various spark gaps. With an output around 200 kV and a rise-time less than 2 ns, the micro-Marx can multichannel field distortion gaps or fire a number of gaps without much gap-to-gap isolation. This design features small size, low cost, and good triggering characteristics. The complete unit is shown.

26700 (ORNL/TM—7777) Initial trade and design studies for the fusion engineering device. Flanagan, C.A.; Steiner, D.; Smith, G.E. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 334p. NTIS, PC A15/MF A01. Order Number DE81024270.

The Magnetic Fusion Energy Engineering Act of 1980 calls for the operation of a Fusion Engineering Device (FED) by 1990. It is the intent of the Act that the FED, in combination with other testing facilities, will establish the engineering feasibility of magnetic fusion energy. The Fusion Engineering Design Center (FEDC), under the guidance of a Technical Management Board (TMB), initiated a program of trade and design studies in October 1980 to support the selection of the FED concept. This document presents the results of these initial trade and design studies. Based on these results, a baseline configuration has been identified and the Design Center effort for the remainder of the fiscal year will be devoted to the development of a self-consistent FED design description.

26701 (ORNL/TM—7778) Status of the tokamak program. Sheffield, J. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 140p. NTIS, PC A07/MF A01. Order Number DE81025126.

During the past two decades, the tokamak program has made significant advances. As a result of these advances, the pro-

gram has expanded, and construction is nearly completed of large facilities, including the US Tokamak Fusion Test Reactor (TFTR), that are capable of achieving energy break-even in the plasma. Design work is under way on the next application phase, exemplified by the US Fusion Engineering Device (FED) and the IAEA INTOR programs. There are many excellent reviews that give a broad history of the evolution of the tokamak program. In addition, reviews are available that give detailed descriptions of individual tokamak elements. This paper reviews the status of the tokamak program, concentrating on recent advances and areas important to the further advancement of the tokamak concept.

26702 (ORNL/TM—7828) FLUNG: coupled 35-group neutron and 21-group gamma ray, P_3 cross sections for fusion applications. Santoro, R.T.; Roussin, R.W.; Barnes, J.M. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE81025113.

A 35-neutron, 21-gamma ray, P_3 cross section library for 63 nuclides is described. The library, called FLUNG (Fusion Library for Unshielded Neutron-Gamma-Ray Transport), was derived from the VITAMIN-C general purpose fine group library and is useful for the neutronic analysis of fusion reactors and other applications.

26703 (PPPL—1797) Balmer alpha emission and hydrogen atom energy in ion-source discharges. McNeill, D.H.; Kim, J. (Princeton Univ., NJ (USA). Plasma Physics Lab.; General Atomic Co., San Diego, CA (USA)). Jul 1981. Contract AM02-76CH03073. 35p. NTIS, PC A03/MF A01. Order Number DE81023973.

The structure of the hydrogen Balmer alpha line emission profiles from three types of neutral beam injector ion source plasmas (filling pressure $\sim$ 10 mTorr, electron density $\sim$ 1 to 2 x 10^{12} cm^{-3}, electron temperature $\sim$ 2 to 4 eV) is studied with the aid of a simple model for the neutral particle balance and H/sub α/ emission. A large fraction of the H/sub α/ is produced by dissociative excitation of H_2 and dissociative recombination of H_3^+, while the remainder is produced by excitation of H atoms, most of which have energies that are close to the characteristic H_2 dissociation energies. The H/sub α/ linewidth is thus insensitive to the discharge operating conditions and equals $\sim$ 0.27 A when only slow ($\sim$ 0.3 eV) dissociatively excited atoms are present or $\sim$ 0.35 A when fast ($>$ 1 eV) atoms, apparently also produced in dissociation reactions, are present as well.

26704 (PPPL—1803) Possible non-hydrogen neutralizers for high energy D^+ and H^+ beams. Grisham, L.R.; Post, D.E. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1981. Contract AM02-76CH03073. 20p. NTIS, PC A02/MF A01. Order Number DE81023134.

We explore the utility of using a gas other than hydrogen isotopes to neutralize energetic beams of D^+ or H^+ for applications in magnetic confinement fusion. We find that at D^+ energies above 160 keV, helium, relative to hydrogen, offers significant improvements in neutralization efficiency and in enrichment of the full energy component of the beam, and that similar advantages accrue with neon at D^+ energies in excess of 200 keV.

26705 (PPPL—1809) Resistive demountable toroidal-field coils for tokamak reactors. Jassby, D.L.; Jacobsen, R.A.; Kalnavarns, J.; Masson, L.S.; Sekot, J.P. (Princeton Univ., NJ (USA). Plasma Physics Lab.; EG and G Idaho, Inc., Idaho Falls (USA)). Jul 1981. Contract AM02-76CH03073. 11p. (CONF-801011—102). NTIS, PC A02/MF A01. Order Number DE81023971.

From 4. ANS topical meeting on the technology of controlled nuclear fusion; King of Prussia, PA, USA (14 Oct 1980).

Readily demountable TF (toroidal-field) coils allow complete access to the internal components of a tokamak reactor for maintenance of replacement. The requirement of readily demountable joints dictates the use of water-cooled resistive coils, which have a host of decisive advantages over superconducting coils. Previous papers have shown that resistive TF coils for tokamak reactors can operate in the steady state with acceptable power dissipation (typically, 175 to 300 MW). This paper summarizes results of parametric studies of size optimization of rectangular TF coils and of a finite-element stress analysis, and examines several candidate methods of implementing demountable joints for rectangular coils constructed of plate segments.

26706 (SAND—80-2500) Particle beam fusion progress report, January-June 1980. (Sandia National Labs., Albuquerque, NM (USA)). May 1981. Contract AC04-76DP00789. 180p. NTIS, PC A09/MF A01. Order Number DE81025316.

An overview and technical summaries are given for research progress in each of the following general areas: (1) fusion target studies; (2) target experiments; (3) particle beam source theory; (4) diagnostics development; (5) particle beam experiments; (6) pulsed power research and development; (7) pulse power application; and (8) Electron Beam Fusion Accelerator project. (MOW)

26707 (SAND—81-0477C) Plasma channels for intense ion beam transport: theory. Freeman, J.R.; Baker, L.; Cook, D.L. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810620—3). NTIS, PC A02/MF A01. Order Number DE81024916.

From 4. international topical conference on high-power electron and ion-beam research and technology; Palaiseau, France (29 Jun 1981).

Current-carrying plasma channels have been proposed for transporting intense ion beams from the diodes to the central target region in reactors. At the gas pressures required for reasonable beam collisional energy loss (10 to 20 torr argon), the Lorentz force produced by the channel current can prevent the expansion and density reduction required for efficient beam propagation. A two-stage current pulse is shown to provide a way for meeting both the channel current and density requirements.

26708 (SAND—81-0599C) Theory of AMPFION class ion diodes. Mendel, C.W.; Miller, P.A.; Quintenz, J.P.; Seidel, D.B.; Slutz, S.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810620—2). NTIS, PC A02/MF A01. Order Number DE81023742.

From 4. international topical conference on high-power electron and ion-beam research and technology; Palaiseau, France (29 Jun 1981).

A number of recent ion diodes have employed series magnetic field coils to provide electron insulation. These coils are designed to provide uniform magnetic field at the anode. This feature allows the diode to be modeled by analytic theory. When combined with PIC computer simulations, the design process can be carried on with high confidence. Much of the theory can be used qualitatively and semi-quantitatively for other magnetically insulated diodes.

26709 (SAND—81-0695C) UV-laser-triggered switches. Woodworth, J.R.; Frost, C.A.; Green, T.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 13p. (CONF-810659—1). NTIS, PC A02/MF A01.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

Two techniques of UV laser triggering for high voltage spark gaps have been developed in which a KrF laser (248nm) is used to create an ionized channel through the dielectric gas in the spark gap. First, with a low-divergence KrF laser, we have studied laser induced breakdown in SF_6 and have applied this phenomenon to trigger a 0.5-MV spark gap. Second, we have studied the use of additives to the usual dielectric gas, such as Tripropylamine, which undergo 2-step ionization in a KrF laser field, and determined that they allow nanosecond-jitter laser triggering even with the use of a relatively low optical quality beam. Data are presented for a 0.5 MV pulse charged switch triggered with a low divergence KrF laser at 80% of its self-breakdown voltage which demonstrate a 1-σ jitter of 150 ps.

26710 (SAND—81-0750C) Operation of the new Hermes II Marx. McClenahan, C.R.; Leifeste, G.T. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 10p. (CONF-810659—7). NTIS, PC A02/MF A01. Order Number DE81023679.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

Because of the unavailability of replacement capacitors of the type used since 1968, it became necessary by early 1980 to plan for a new replacement Marx generator in Hermes II. This replacement was accomplished during the period between October 1, 1980 and March 1, 1981. The new Marx consists of four modules in series, each of which is similar to a PBFA-II Marx, for a total of 128 capacitors. The erected capacitance is 10 nF, the inductance is 25 μH, and the maximum capacitor charge voltage is 100 kV. The total run time from fire command until diode output is about 2 μs. This 2 μs includes approximately 300 ns trigger Marx run time, 900 ns Marx erection time, and 900 ns Blumlein charge time. Due to the faster Blumlein charge time, the new Bremsstrahlung radiation output from Hermes II has increased by 60% compared to that with the old Marx. A unique new shorting system has been added which can short each capacitor individually thereby ensuring a completely discharged Marx and a safer system to work on during repairs and maintenance.

26711 **(SAND—81-0751C) PBFA I performance monitoring and evaluation system (PMES).** Neau, E.L.; Boyer, W.B. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 3p. (CONF-810659—9). NTIS, PC A02/MF A01. Order Number DE81023681.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

The PBFA I accelerator is a large distributed system which, in effect, contains 36 separate accelerators. Conventional analog recording of 8 to 10 monitor signals from each accelerator module is undesirable from a cost standpoint as well as from the standpoint of physically interpreting the data. It would be possible to monitor just one output signal from each module; however, in an operating environment it would be helpful to be able to pinpoint the stage within a module which caused the module to malfunction. The accumulation of sufficient data on each machine shot could also be used to form a data base which would be helpful in tracking long-term trends in individual component operation. Such a tracking scheme could predict component failures before they interfere with the experimental program. Computer based systems have been developed for high energy physics experiments under the guidelines of the IEEE Std 583-1975 for CAMAC instrumentation. Commercially available CAMAC modules have been incorporated in a low cost 250 channel data acquisition system for the PBFA I accelerator which gives a readout of selected accelerator parameters such as peak voltages, peak currents, and switch firing times within minutes of an experimental shot.

26712 **(SAND—81-1524C) Application of reparameterized Fourier descriptors of e-beam target boundaries.** Ghiglia, D.C. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810623—4). NTIS, PC A02/MF A01. Order Number DE81024067.

From 24. midwest symposium on circuits and systems; Albuquerque, NM, USA (29 Jun 1981).

Two methods are derived for obtaining Fourier descriptors of simple plane closed curves. The results produced are dependent on a desirable parametric form of the curve (i.e., using arc length or central angle) and not on the actual parametric form that is available. When applied to a typical target boundary, each resulting set of Fourier descriptors defines the boundary harmonic content, but the magnitudes and distributions must be interpreted in the proper context.

26713 **(UCRL—86041) Obtaining full operation for a large suite of neutral-beam injectors.** Moore, T.L.; Kane, R.J.; Meyer, D.A. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). 15 May 1981. Contract W-7405-ENG-48. 9p. (CONF-810527—4). NTIS, PC A02/MF A01.

From International conference on plasma science; Sante Fe, NM, USA (18 May 1981).

In order to operate a neutral beam injector properly, its power supplies must be controlled accurately and repeatably. When a large number of neutral beams are to be operated simultaneously, the burden of monitoring the beam performance falls to the operator. To assist in the operation of the 24 neutral beams on the LLNL Tandem Mirror Experiments, (TMX), a multiple processor, fiber optic linked, CAMAC based control system was developed. This system allows four operators to successfully control 24 neutral beams through beam conditioning to full operation.

99 GENERAL AND MISCELLANEOUS

26714 **(UCRL—86304) Setting up a photographer to do a good job.** Klimkowsky, B.F. (Lawrence Livermore National Lab., CA (USA)). 1 May 1979. Contract W-7405-ENG-48. 6p. (CONF-790509—3). NTIS, PC A02/MF A01. Order Number DE81025003.

From 26. international technical communication conference; Los Angeles, CA, USA (16 May 1979).

Many who enlist the services of photographers repeatedly find it hard to obtain pictures exactly meeting the need. At the heart of the difficulty is inadequate communication. This paper presents a simplified procedure for remedying this problem; it teaches how to inform the photographer, in a language certain to be understood. Writers, editors, designers and others seeking useful photos can optimize the process by clarifying their communication needs based on client and audience, by visiting a location in advance to plan photo composition, and by passing on all pertinent information to the photographer when setting up the appointment as well as when shooting day arrives.

26715 **(JPRS—78269) East Europe report: scientific affairs, No. 706.** (Joint Publications Research Service, Arlington, VA (USA)). 10 Jun 1981. Translation of various articles. 47p. NTIS.

Research and technology from Czechoslovakia, Hungary, and Poland are described. Topics include: cryogenics in internal combustion engine assembly, CSSR Interkosmos cooperation, CSSR-Hoechst cooperation, data processing developments in Hungary, a Polish space program for plasma research, and a Polish long-range polar research program.

9901 Management

REFER ALSO TO CITATION(S) 26402

26716 (DOE/BETC/IC—80/3(Vol.4), pp 5p, Paper 31) **Development of an automated project tracking system for the Bartlesville Energy Technology Center.** Plumb, R.L. (Advanced Technology, Inc., Bartlesville, OK). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 1980.

Advanced Technology, Inc. (ADTECH) is developing a computerized system to keep track of the various technical projects being managed by the Bartlesville Energy Technology Center (BETC). The Project Tracking System (PTS) software is resident upon the BETC's PDP 11/70 computer which utilizes the RSX-11M operating system. The PTS has been designed to aid in the in-house monitoring of the schedule, cost, and manpower status of the approximately 200 BETC contracts, as well as to generate automatic updates to other DOE systems such as the Business Management Information System (BMIS). During the first contract year (July 1979 to July 1980), a user requirements analysis was conducted, the conceptual system design was completed and approved, the necessary software was developed and tested, and the entire system was installed on the BETC computer.

26717 (DOE/BETC/IC—80/3(Vol.4), pp 7p, Paper 32) **Development of an operational framework for the Liquid Fossil Fuel Cycle (LFFC).** Kebely, V.; Hartman, M. (Aerospace Corp., El Segundo, CA). 1980. NTIS, PC A14/MF A01.

In Processing and utilization. Annual report, October 1, 1979-September 1980.

The project to provide the Bartlesville Energy Technology Center (BETC) with a Critical Path Method (CPM) Program Management System (PMS) is described. This system will be used to facilitate mission oriented program planning/replanning, program management/redirection, resource allocation/reallocation, and re-

sponse to: (1) higher levels within DOE, (2) congressional inquiries, (3) executive department requests (e.g., OMB) and (4) sources of question or interest.

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 24903, 25102, 25112, 26015, 26016, 26082, 26475, 26620, 26626, 26627, 26665

26718 (GA-A—16148) Simplified plotting package for the LSI-11 computer and Tektronix terminals. Henline, P. (General Atomic Co., San Diego, CA (USA)). Dec 1980. Contract AT03-76ET51011. 25p. NTIS, PC A02/MF A01. Order Number DE81025140.

These plotting subroutines were written to allow the user to do plotting easily and quickly, but do not contain many fancy features in order to minimize memory space. Plots are produced of real values only. The first element of the plotting array contains the number of points to plot and the values to plot are stored in the remaining array locations. The maximum number of points which can be plotted is 300. The user must provide titles and other alpha numeric information. This can be done easily by a call to LOCATE, then ALPHA, and then doing a FORTRAN write. LOCATE and ALPHA are part of the Oak Ridge TEK11 Graphics Package. All plots are framed and labeled. The X axis has ten tick marks and three labels (left, center, and right side) and the Y axis has three tick marks and three labels. The subroutines assume the user is smart. Curves (especially when more than one is drawn on one plot) are assumed to be completely within the defined area as no clipping or dark lines are drawn. The user has the ability to do multiple curves on one graph or multiple graphs on a page.

26719 (LA-UR—80-3457) Illustrator's view of more-effective technical communication through computer graphics. DeGasperi, K.D. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 12p. (CONF-810805—3). NTIS, PC A02/MF A01.

From SIGGRAPH'81 meeting; Dallas, TX, USA (3 Aug 1981).

The need for dynamic and well-designed presentations is critical for effective technical communication. Computer graphics as an art media tool for the illustrator often surpasses other available media. After the speed of the computer, its capability to produce an incredible range of complex color schemes makes it such an invaluable aid. However, it is evident that this medium is frequently not used to its fullest capacity in the field of technical communication. This is because of the lack of well-designed visual presentations. In particular, this situation is often caused by the improper use of color, the lack of contrast, and visual continuity. Improving the state-of-the-art in the area of visual presentations is achievable by including graphic design techniques, a common-reference language, and by improving versatility in graphics programs and software packages.

26720 (LA-UR—80-3642) Metafile for efficient sequential and random display of graphics. Reed, T.N. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 12p. (CONF-810805—1). NTIS, PC A02/MF A01.

From SIGGRAPH'81 meeting; Dallas, TX, USA (3 Aug 1981).

Graphics metafiles have been in use at the Los Alamos National Laboratory (LANL) since early 1977. The first metafile format was defined in 1976 and has been revised several times to provide efficient graphics support in the LANL computing environment. Objectives and current applications of the Common Graphics System (CGS) Metafile are given. Details of the format and the random access techniques incorporated in the CGS Metafile are described.

26721 (LA-UR—80-3716) Satellite graphics output station. Wolf, R. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 18p. (CONF-810805—2). NTIS, PC A02/MF A01.

From SIGGRAPH'81 meeting; Dallas, TX, USA (3 Aug 1981).

The Los Alamos National Laboratory Computer Division has developed a satellite graphics output station. This station serves to directly accept user requests for output via a large computer network. The system orders these requests and schedules output on one of several devices consistently with the user's request and the overall job turnaround requirements of the Laboratory. The system translates a standard Metafile into a device-specific format and efficiently generates the requested output. At this same time, PAGES provides some graphics processing, previously provided by the large supercomputers. The system provides current information on queues, jobs being processed, and the devices. An effective quality control program is an integral part of the system design. This system will continue to reduce user interface changes, hold down operational cost, make effective use of supercomputer time, and produce quality output. The system was made possible by LANL standardization efforts including development of the Common Graphics System, the CGS Metafile, the standard file header and ICN standards.

26722 (MLM—2841(OP)) GRPAUT: a computer code for automated isotopic analysis of plutonium spectra. Fleissner, J.G. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 6p. (CONF-810706—6). NTIS, PC A02/MF A01.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

GRPAUT is a modular computer program for performing isotopic analyses of plutonium or plutonium-uranium spectra. The program can be used to analyze gamma-ray spectra from samples of arbitrary mass, burnup, age, and chemical composition. The software package is designed for minicomputer use and technician-level operation. The statistical precision of spectral measurement has been found to provide a good measure of the accuracy of the analytical procedure.

26723 (SAND—80-1952) Isolated data-acquisition system. Stoker, G.C.; Sharp, C.L. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 38p. NTIS, PC A03/MF A01. Order Number DE81025318.

This report describes a microprocessor-controlled data acquisition module which is battery powered and communicates with a master computer via a fiber optic link. This allows the module to be used in hazardous areas with complete electrical isolation. The module allows digital inputs, digital outputs, and analog to digital conversion with analog input multiplexing. A complete description is given along with diagrams, schematics, and program listings.

26724 (SAND—80-2602C) Improved data-reduction methods for laser-pulse-diffusivity determination with the use of minicomputers. Koski, J.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 27p. (CONF-810683—2). NTIS, PC A03/MF A01. Order Number DE81024070.

From International joint conference on thermophysical properties; Gaithersburg, MD, USA (15 Jun 1981).

Some improved data reduction and analysis techniques for pulse diffusivity measurements which exploit the capabilities of minicomputers are described and demonstrated. Specific topics include the following: (a) a generalized approach for obtaining simultaneous laser pulse time and radiative heat loss corrections for an arbitrary laser pulse shape is developed. A large scale computer is initially used to calculate convolution integral solutions and generate correction factors. The results are then placed, via a two-dimensional curve fit, into a form convenient for minicomputers. Data reduction approaches of either Cowan, or Clark and Taylor can be used. (b) A parameter estimation theory approach to data reduction is presented as an alternative to the usual data reduction methods of Cowan or Clark and Taylor. The estimation approach, intended primarily for use as a diagnostic tool, involves fitting an analytical solution to experimental data by minimizing the mean square error between the two. Thermal diffusivity and radiative loss factor are determined simultaneously from a solution form which includes laser pulse time corrections. With on-line plotting capabilities the method can be used to examine the systematic deviations between theory and experiment with moderate expenditures of computer time. (c) The use of nonrecursive linear digital noise filters based on finite Fourier transform techniques is discussed as a method for smoothing of data on minicomputers. Some results obtained for

pulse diffusivity data with the use of a filter with hanning window characteristics are presented.

26725 (SAND—80-8053) Plotting program for milestone schedules and status reports user's manual. Yano, H.; Tucker, R.H.; Genoni, J. (Sandia National Labs., Livermore, CA (USA)). Jun 1981. Contract AC04-76DP00789. 14p. NTIS, PC A02/MF A01. Order Number DE81024266.

A program has been written for producing milestone schedules and status reports with a computer. Entering data on a Tektronix 4014 video terminal, the user can create, correct, and store schedules in tabular or bar-chart form. For the bar charts, hard copies can be obtained from a Tektronix 4631 or 35-mm film from the computer. This document gives the complete instructions for using the program.

26726 (SAND—81-0627) Code translation program for Hewlett-Packard computers. Linnerooth, T.B. (Sandia National Labs., Albuquerque, NM (USA)). May 1981. Contract AC04-76DP00789. 23p. NTIS, PC A02/MF A01. Order Number DE81025249.

A computer program which was designed to copy to and from magnetic tapes with code conversion is described. The program is compatible with Hewlett-Packard's RTE-IVB operating system.

26727 (SAND—81-0859) Sandia Computing Network NOS link conceptual design. Halbgewachs, R.D.; Haynes, R.A.; Harris, D.L. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 19p. NTIS, PC A02/MF A01. Order Number DE81025891.

This report describes the conceptual design of a link between the CDC 6600 computers and the high bandwidth network interconnect. This NOS link will provide the Sandia user community with network capabilities by interfacing the mainframe computers using the CDC NOS operating system to the Central Computing Network. Topics covered in the report are a description of hardware, expected network capabilities, and a functional description of software facilities and flow control.

26728 (SLAC-PUB—2727) Support and utilization of the LSI-11 processor family at SLAC. Kieffer, J.; Logg, C.A.; Farwell, D.E. (Stanford Linear Accelerator Center, CA (USA)). 1981. Contract AC03-76SF00515. 7p. (CONF-810546—3). NTIS, PC A02/MF A01. Order Number DE81025147.

From 1981 spring DECUS U.S. symposium; Miami Beach, FL, USA (18 May 1981).

Microcomputer systems based on the DEC LSI-11 processor family have been in use at SLAC for five years. They are used for a wide variety of applications. The support of these systems is divided into three general areas: engineering, maintenance, and software. Engineering specifies the system to match user requirements. SLAC has been able to design one general purpose system which can be tailored to fit many specific requirements. Maintenance provides system and component diagnostic services and repair. Software support includes software consulting services, assistance in systems design, and the development and support of special purpose operating systems and programs. These support functions are handled as subtasks by three teams in the SLAC Electronics Instrumentation Group. Each of these teams utilizes several LSI-11 systems in the performance of its primary tasks. They work closely together to jointly provide overall support for the larger SLAC community.

26729 (UCRL—86104) Speech processing based on short-time Fourier analysis. Portnoff, M.R. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 2 Jun 1981. Contract W-7405-ENG-48. 12p. (CONF-810821—1). NTIS, PC A02/MF A01. Order Number DE81024917.

From US-Italy workshop in digital signal processing; Portovenere, Italy (25 Aug 1981).

Short-time Fourier analysis (STFA) is a mathematical technique that represents nonstationary signals, such as speech, music, and seismic signals in terms of time-varying spectra. This representation provides a formalism for such intuitive notions as time-varying frequency components and pitch contours. Consequently, STFA is useful for speech analysis and speech processing. This paper shows that STFA provides a convenient technique for estimating and modifying certain perceptual parameters of speech. As an example of an application of STFA of speech, the problem of time-compression or expansion of speech, while preserving pitch and time-varying frequency content is presented.

26730 Universal formats for nonlinear ordinary differential systems. Kerner, E.H. (Sharp Physics Laboratory, University of Delaware, Newark, Delaware 19711). *Journal of Mathematical Physics (New York) ;* **22**: No. 7, 1366-1371(Jul 1981).

It is shown that very general nonlinear ordinary differential systems (embracing all that arise in practice) may, first, be brought down to polynomial systems (where the nonlinearities occur only as polynomials in the dependent variables) by introducing suitable new variables into the original system; second, that polynomial systems are reducible to "Riccati systems," where the nonlinearities are quadratic at most; third, that Riccati systems may be brought to elemental universal formats containing purely quadratic terms with simple arrays of coefficients that are all zero or unity. The elemental systems have representations as novel types of matrix Riccati equations. Different starting systems and their associated Riccati systems differ from one another, at the final elemental level, in order and in initial data, but not in format.

26731 Numerical evaluation of integrals containing a spherical Bessel function by product integration. Lehman, D.R.; Parke, W.C.; Maximon, L.C. (Department of Physics, The George Washington University, Washington, D. C. 20052). *Journal of Mathematical Physics (New York) ;* **22**: No. 7, 1399-1413(Jul 1981).

A method is developed for numerical evaluation of integrals with k-integration range from 0 to ∞ that contain a spherical Bessel function j/sub l/(kr) explicitly. The required quadrature weights are easily calculated and the rate of convergence is rapid: only a relatively small number of quadrature points is needed: for an accurate evaluation even when r is large. The quadrature rule is obtained by the method of product integration. With the abscissas chosen to be those of Clenshaw—Curtis and the Chebyshev polynomials as the interpolating polynomials, quadrature weights are obtained that depend on the spherical Bessel function. An inhomogenous recurrence relation is derived from which the weights can be calculated without accumulation of roundoff error. The procedure is summarized as an easily implementable algorithm. Questions of convergence are discussed and the rate of convergence demonstrated for several test integrals. Alternative procedures are given for generating the integration weights and an error analysis of the method is presented.

26732 Poisson trials approach to interpopulation comparisons of cause of death data. Ginevan, M.E. (Argonne National Lab., IL). Contract W-31-109-ENG-38. *Environmental Research ;* **25**: No. 7, 147-159(Jun 1981).

If the expected number of deaths from cause i in a given population is small relative to the size of the population, the probability of observing K deaths from cause i is given, approximately, by the Poisson probability distribution with parameter λ equal to the expected number of deaths. The present discussion uses this fact to develop tests of whether or not the observed number of deaths in a given population is large relative to some parametric expected value, or the observed number of deaths in some control population. Power calculations for these tests are given as well as methods for calculating both the necessary sample size for a given power and the power required for meaningful statistical inference.

9903 Information Handling

REFER ALSO TO CITATION(S) 24976, 24988, 25590, 25599, 26716

26733 (DOE/EV/10428—9) Theory for coloring bivariate statistical maps. Trumbo, B.E. (SIAM Inst. for Mathematics and Society, Philadelphia, PA (USA); Stanford Univ., CA (USA). Dept. of Statistics). Dec 1980. Contract AC02-80EV10428. 54p. NTIS, PC A02/MF A01.

Some purposes that might be envisioned for statistical bivariate color maps are discussed. Principles for selection of coloring schemes for such maps, depending on purpose, are formulated. Color models involving perceptually important aspects - hue, saturation, brightness - give the theoretical basis for obtaining schemes that satisfy various criteria. Schemes are viewed as transformations from color models to the unit square. Principles are interpreted in terms of properties of transformations. Several schemes, including those used by the US Census Bureau, ones proposed elsewhere as improvements upon the Census Bureau schemes, and several new ones, illustrate the theory.

CORPORATE INDEX

In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the report title and the volume and abstract numbers. Report numbers, if applicable, are given in parentheses at the end of the entry.

DOE Energy Information Data Base: Corporate Author Entries (DOE/TIC-4585) is used in the standardization of corporate entries. DOE/TIC-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

A

Academy of Natural Sciences of Philadelphia, PA (USA)
Freshwater bivalve mollusca (unionidae, sphaeriidae, corbiculidae) of the Savannah River Plant, South Carolina, 6:26211 (SRO-NERP—3)

Academy of Natural Sciences of Philadelphia, PA (USA). Div. of Limnology and Ecology
Phytoplankton studies and nutrient concentrations in the vicinity of the C. P. Crane Generating Station. Final report Jul 79 to Mar 80, 6:26325 (PB—81-114746)

Acres American, Inc., Buffalo, NY
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix E. Electrical systems. Final report, 6:25571 (EPRI-EM—1589(Vol.9)(App.E))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix A. Upper reservoir. Final report, 6:25574 (EPRI-EM—1589(Vol.8)(App.A))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix E. Lower reservoir. Final report, 6:25575 (EPRI-EM—1589(Vol.8)(App.E))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 13. CAUPH preliminary licensing documentation. Final report, 6:25213 (EPRI-EM—1589(Vol.13))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix C. Heavy hoist. Final report, 6:25210 (EPRI-EM—1589(Vol.8)(App.C))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 6. Site investigation: shallow drilling. Final report, 6:25568 (EPRI-EM—1589(Vol.6))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 7. Site investigation: deep drilling. Final report, 6:25569 (EPRI-EM—1589(Vol.7))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix B. Champagne effect. Final report, 6:25570 (EPRI-EM—1589(Vol.9)(App.B))

Acres American, Inc., Columbia, MD
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)
Small hydro plant development program, 6:25212 (DOE/ID/01570—T21(Vol.3)App.L)
Small hydro plant development program. Volume 1. Text, 6:25209 (DOE/ID/01570—T21(Vol.1))

Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.
An automatic isokinetic sampler for particulate emissions from aircraft gas turbine engines. Final report Feb 75-Jun 78, 6:25852 (AD-A—090280)
Survey of EPA facilities for solar thermal energy applications. Final report 1 Nov 77-30 Jun 78, 6:25643 (PB—81-109316)

Aerojet Energy Conversion Co., Sacramento, CA (USA)
Study of gelled LNG, 6:25078 (DOE/TIC—11452)

Aerospace Corp., El Segundo, CA (USA)
Measurements of typical insolation variation at Daggett, California. Volume I. Methodology and sample data, 6:25224 (ATR—80(7747)-1(Vol.1))
Measurements of typical insolation variation at Daggett, California. Volume II. Appendices including data sets, 6:25225 (ATR—80(7747)-1(Vol.2))

AeroVironment, Inc., Pasadena, CA (USA)
Advanced and innovative wind energy concept development: dynamic inducer system. Executive summary, 6:25427 (SERI/TR—8085-1-T1)
Advanced and innovative wind energy energy concept development: dynamic inducer system. Research report, 6:25428 (SERI/TR—8085-1-T2)
Assessing the local windfield with instrumentation, 6:25423 (PNL—3622)

Agbabian Associates, Seattle, WA (USA)
Geotechnical data from accelerograph stations investigated during the period 1975-1979. Summary report, 6:26419 (NUREG/CR—1643)

AIA Research Corp., Washington, DC (USA)
Survey of passive solar homes, 6:25345 (HUD-PDR—589)

AiResearch Mfg. Co., Torrance, CA (USA)
NTEV flywheel bearing integrity test, 6:25882 (DOE/CS/51213—T6)

Air Force Engineering and Services Center, Tyndall AFB, FL (USA). Engineering and Services Lab.
USAF aircraft engine emission goals: a critical review. Final report Sep 78-Jun 79, 6:25853 (AD-A—090282)

Air Force Inst. of Tech., Wright-Patterson AFB, OH (USA). School of Engineering
Time dependent Navier-Stokes solution of a turbulent gas jet ejected from a rectangular orifice into a high-subsonic crossflow. Doctoral thesis, 6:26031 (AD-A—090343)

Air Force Special Weapons Center, Kirtland AFB, NM (USA)
Initial neutron and gamma air-earth interface measurements. Final report, 6:26101 (AD—464381)

Air Products and Chemicals, Inc., Trexlertown, PA (USA)
Load-change testing of a large commercial oxygen plant. Final report, 6:24862 (EPRI-NP—1824)

Alderson Broaddus Coll., Philippi, WV (USA)
Solar heating and hot water system installed at Alderson Broaddus College, Philippi, West Virginia, 6:25341 (DOE/NASA/CR—161756)

Allied-General Nuclear Services, Barnwell, SC (USA)
GEND planning report, 6:25525 (GEND—001)
Studies and research concerning BNFP design and construction of a spent-fuel disassembly/encapsulation system, 6:25101 (AGNS—47921-2.1-14)

Altran Electronics, Inc., Harbor City, CA (USA)
Broadcast radio system for distribution communications. Final report, 6:25477 (EPRI-EL—1868)

American Inst. of Baking, Manhattan, KS
Evaluation of potential food applications of dried distillers spent grain (DSG). Final research report, 6:25798 (DOE/CS/40352—T1)

American Public Works Association, Chicago, IL
Resouce recovery option in solid-waste management: a review guide for public officials , 6:25839 (DOE/CS/20156—T1)

American Univ., Washington, DC
Definition of chemical and electrochemical properties of a fuel cell electrolyte. Final technical report 25 Mar 77-24 Jun 80, 6:25661 (AD-A—089776)
Ames Lab., IA (USA)
Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980, 6:24929 (IS—4773)
Analysis of dielectric heating and conductive cooling of pyrite in coal, 6:24948 (IS-M—311)
Applications of moment methods to finite nuclei, 6:26603 (IS-M—320)
Assessment of the environmental impact of power plant fly ash, 6:24933 (IS-M—309)
Desulfurization of coal by oxidation in alkaline solutions, 6:24867 (IS-M—318)
Displacement discontinuity method applied to NDE-related stress problems, 6:26045 (IS-M—328)
Environmental monitoring at Ames Laboratory: calendar year 1980, 6:26167 (IS—4768)
Evaluation of the removal of organic sulfur from coal, 6:24866 (IS-M—317)
Preparation of high-purity silicon using thermite reactions. Final report, October 1, 1979-November 30, 1980, 6:25905 (IS—4762)
Remaining fatigue lifetime prediction for retirement-for-cause in aluminum alloys, 6:25906 (IS-M—315)
Thermodynamics and phase equilibria in the binary systems of vanadium with IV B elements, 6:25907 (IS-M—319)
VII. Overview of current status of solid-gas interface science, 6:25979 (IS-M—316)
Appalachian State Univ., Boone, NC (USA)
Community environmental education: three models of organization for PSD Set II. Final report, 6:25606 (PB—81-118721)
Applied Communication Research, Inc., Palo Alto, CA (USA)
Application of proactive behavioral techniques for the promotion of solar retrofit in condominiums: the Friars Village case study, 6:25327 (DOE/CS/10210—T1)
Handbook for the marketing of conservation and solar-energy programs, 6:25849 (DOE/CS/10210—T2)
ARD, Inc., Burlington, VT (USA)
Market assessment of photovoltaic power systems for agricultural applications in the Philippines, 6:25297 (DOE/NASA/0180—1)
Argonne National Lab., IL (USA)
Accelerator mass spectrometry and radioisotope detection at the Argonne FN tandem facility, 6:26070 (CONF-8006123—2)
Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)
Americium migration in basalt and implications to repository risk analysis, 6:25164 (CONF-8010130—8)
Analysis of in-situ tritium recovery from solid fusion-reactor blankets, 6:26675 (CONF-801011—90)
Analytical techniques for ambient sulfate aerosols, 6:26111 (ANL—81-12)
Argonne tandem as injector to a superconducting linac, 6:26064 (CONF-8006123—3)
Argonne's program in heavy-ion fusion, 6:26668 (CONF-800740—28)
Assessment of the impacts of water intakes on alewife, rainbow smelt, and yellow perch populations in Lake Michigan, 6:26296 (ANL/ES—109)
Biological removal of organic constituents in high-Btu coal gasification wastewaters, 6:24924 (CONF-8006171—1)
Calculational method for combined natural circulation and forced-convection flow in a channel, 6:25518 (CONF-800723—26)
Carbon stripper foils for heavy-ion accelerators, 6:26069 (CONF-801111—46)
Case for exotic baryon-baryon states, 6:26519 (ANL-HEP-CP—80-75)
Choice of coolant in commercial tokamak power plants, 6:26672 (CONF-801011—87)
Continuous-System-Modeling Program III: simulation of a solar collector under stagnation conditions, 6:25379 (CONF-800804—39)
Data interpretation, objective evaluation procedures and mathematical techniques for the evaluation of energy-dependent ratio, shape and cross section data, 6:26596 (CONF-800979—19)
Deformation microstructures and mechanical equations of state, 6:25898 (CONF-801148—6)
Design and construction of a large superconducting MHD magnet for the Coal-Fired Flow Facility at the University of Tennessee Space Institute, 6:25647 (CONF-800631—10)
Development of nondestructive-evaluation techniques for high-temperature ceramic heat-exchanger components. Semiannual report, October 1980-March 1981, 6:25934 (ANL/MSD/FE—81-1)
Development of tritium breeding blankets for DT-burning fusion reactors, 6:26677 (CONF-801011—92)
Economic and environmental tradeoffs in coal conversion, 6:25638 (CONF-800608—8)
Economic 5-megajoule heavy-ion driver for mid-term fusion goals, 6:26685 (CONF-801011—101)
Efficacy of activated sludge/powdered activated carbon for removal of organic constituents in wastewater from commercial-scale, high-Btu coal gasification plant, 6:24925 (CONF-8006171—2)
Electromagnetic effects involving a tokamak reactor first wall and blanket, 6:26676 (CONF-801011—91)
Electron spectra and structure of atomic and molecular clusters, 6:26450 (CONF-8004161—1)
Energies of <110> coincidence twist boundaries, stacking faults, and free surfaces in metal oxides with NaCl structure, 6:26613 (CONF-800765—9)
Energy and materials flows in petroleum refining, 6:25038 (ANL/CNSV—10)
Energy, capacity, and economic effects of cogeneration interfaced with electric-utility systems, 6:25438 (CONF-801210—27)
Enhancement of a radiation safety system through the use of a microprocessor-controlled speech synthesizer, 6:26076 (CONF-801103—59)
Enhancement of methane gas production using an industrial waste in anaerobic digestion, 6:25179 (CONF-801210—26)
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume I. Dispersion from single and multiple source natural draft cooling towers. Technical report, 6:25459 (NUREG/CR—1581-V-1)
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 2. Salt drift deposition from natural draft cooling towers. Technical report, 6:25460 (NUREG/CR—1581-V-2)
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells. Final report, 6:25583 (ANL/OEPM—80-8)
First-wall, blanket, and shield engineering test program for magnetically confined fusion power reactors, 6:26684 (CONF-801011—100)
First-wall/blanket materials selection for STARFIRE tokamak reactor, 6:26680 (CONF-801011—95)
Foil dissociation of fast molecular ions into atomic excited states, 6:26449 (CONF-801111—49)
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
GEND planning report, 6:25525 (GEND—001)
Groundwater-stream-simulation experiments for the evaluation of the safety of proposed nuclear waste repositories, 6:25120 (CONF-810722—1)
High-temperature Moessbauer study of ^{57}Fe interstitials in Chevrel phases, 6:25945 (CONF-800954—4)
Hydration of spent limestone and dolomite to enhance sulfation in fluidized-bed combustion, 6:24956 (CONF-800806—45)
Hyperparamodulation: a refinement of paramodulation, 6:26626 (CONF-8007106—1)
Identification of product and material differences in active solar systems, 6:25322 (ANL-K—81-74)
Impact of aircraft emissions on air quality in the vicinity of airports. Volume I. Recent airport measurement programs, data analyses, and sub-model development. Final report Jan78-Jul 80, 6:26109 (AD-A—089962)
Impact of New Source Performance Standards on advanced industrial energy technology, 6:25604 (CONF-801210—25)
Implications of the DD fuel cycle on tokamak reactor technology considerations, 6:26678 (CONF-801011—93)
Importance of shield design in minimizing radioactive-material inventory in tokamaks, 6:26670 (CONF-801011—85)

In-situ maintenance of low-Z limiters in reactors, 6:26683 (CONF-801011—99)
Introduction to hydrogen in alloys, 6:25900 (CONF-8006130—3)
Issues associated with coal-slurry-pipeline development, 6:24945 (ANL/EES-TM—139)
Limiter/vacuum system for plasma impurity control and exhaust in tokamaks, 6:26681 (CONF-801011—96)
Liquid-metal MHD for solar and coal, 6:25646 (CONF-800617—8)
Liquid-metal MHD for solar and coal: system and component status, 6:25648 (CONF-800806—42)
Lower-hybrid heating and current drive system for the STARFIRE tokamak, 6:26628 (CONF-801011—97)
Measurements of the oxidation state and concentration of plutonium in interstitial waters of the Irish Sea, 6:26291 (CONF-801063—6)
Method for estimating the challenge to an air-cleaning system resulting from an accidental explosive event, 6:25166 (CONF-801038—23)
Methods of improving limestone utilization in FBC, 6:24955 (CONF-800806—44)
MHD Heat and Seed Recovery Technology Project. Eleventh quarterly report, July-September 1980, 6:25645 (ANL/MHD—80-19)
Model systems in photosynthesis research, 6:26307 (CONF-800963—7)
Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ under extermal magnetic fields, 6:25897 (CONF-801134—16)
NbN materials development for practical superconducting devices, 6:26017 (CONF-800980—38)
Near-term batteries for electric vehicles, 6:25586 (CONF-810315—13)
Neutron strength functions: the link between resolved resonances and the optical model, 6:26601 (CONF-800979—18)
Neutronic optimization of solid breeder blankets for STARFIRE design, 6:26682 (CONF-801011—98)
Nuclear cross sections for light ions on ^{6}Li, 6:26577 (CONF-801111—47)
Observations on grain-boundary structures in nickel oxide, 6:25935 (CONF-800765—10)
Overview of the STARFIRE reference commercial tokamak fusion power reactor design, 6:26679 (CONF-801011—94)
Past lessons and future importance of polarization, 6:26559 (ANL-HEP—80-77)
Phase relationships in positive electrodes of high-temperature lithium aluminum/iron sulfide cells, 6:25587 (CONF-8010159—11)
Photoionization of atomic iodine and atomic tellurium, 6:26447 (CONF-800626—8)
Preliminary evaluation of automated ICES selection methodology, cost, 6:25639 (CONF-800804—41)
Proceedings of the international conference on prepared fuels and resource recovery technology, 6:25199 (ANL/CNSV-TM—60)
Progress and forecast in electric-vehicle batteries, 6:25878 (CONF-800939—2)
Projection of US transportation needs for beyond 1990: a market for advanced vehicles, 6:25879 (CONF-801242—7)
Pulsed laser mixing of Ni-Au surface films on nickel substrates, 6:25895 (CONF-801124—50)
Pulsed neutron sources for condensed-matter research, 6:25175 (CONF-801111—45)
Quadratically convergent MCSCF theory for large-configuration sets, 6:26448 (CONF-800726—2)
Recent progress in lithium/iron sulfide battery development, 6:25585 (CONF-800806—46)
Reduced-form approach for evaluating hospital cost-containment program in paired experiment, 6:26402 (CONF-8008109—1)
Response to annealing and reirradiation of AISI 304L stainless steel following initial high-dose neutron irradiation in EBR-II, 6:25488 (CONF-800609—17)
Safety of superconducting magnets for fusion: thermal and electromagnetic effects of rapid TF coil discharge, 6:26686 (CONF-801011—103)
Six tesla analyzing magnet for heavy-ion beam transport, 6:26067 (CONF-800980—39)
Solar data base management system, 6:25326 (CONF-800804—40)
Spin effects in e^+e^- annihilations, 6:26518 (ANL-HEP-CP—80-69)
STARFIRE: a conceptual design of a commercial tokamak power plant. Paper IAEA-CN-39/E-1, 6:26667 (CONF-800707—26)
STARFIRE burn cycle, 6:26674 (CONF-801011—89)
Starfire poloidal coil systems, 6:26671 (CONF-801011—86)
Status of nickel/zinc and nickel/iron battery technology for electric vehicle applications, 6:25584 (CONF-800612—6)
Status of pollution-control technologies for industrial boilers, 6:26063 (CONF-800608—7)
Steady-state tokamak reactor with non-divertor impurity control: STARFIRE, 6:26669 (CONF-800950—20)
Study of turbulent natural-circulation flow and low-Prandtl-number forced-convection flow, 6:25519 (CONF-800723—27)
Substantive improvement of the thermal efficiency of the mercury-iodine thermochemical cycle ANL-4, 6:25176 (CONF-800616—10)
Superconducting compensator magnets to be used with the HRS spectrometer at the SLAC PEP facility, 6:26068 (CONF-800980—42)
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
Technology assessment of solar energy systems: air-quality effects of direct-solar and biomass systems in high- and low-deployment scenarios, 6:25229 (ANL/EES-TM—140)
Threshold photoneutron angular distribution and polarization studies of nuclei, 6:26591 (CONF-801111—48)
Tongue River in Wyoming: a baseline fisheries assessment, Monarch to the state line, 6:26297 (ANL/LRP—10)
Tritium-handling considerations for ETF and STARFIRE, 6:26673 (CONF-801011—88)
US/USSR joint MHD generator testing at the U-25 MHD pilot plant, 6:25649 (CONF-800806—43)
Vortex unbinding in superconducting thin films, 6:26618 (CONF-800561—4)

Arizona State Univ., Tempe (USA). Dept. of Chemistry
Thermodynamic properties of crystals and melts based on calorimetric data and plagioclass-melt equilibria in the system albite-anorthite-diposide, 6:26427 (DOE/ER/10765—T1)

Army Armament Research and Development Command, Aberdeen Proving Ground, MD (USA). Chemical Systems Lab.
Disposal of soluble salt waste from coal gasification, 6:24923 (AD-A—090419)

Army Electronics Labs., Fort Monmouth, NJ (USA)
Evaluation of military radiac equipment, 6:26100 (AD—460281)

Army Electronics Research and Development Command, Fort Monmouth, NJ (USA). Electronics Technology/Devices Lab.
The charge and discharge behavior of molybdenum trioxide electrodes in lithium perchlorate-propylene carbonate electrolyte. Technical report, 6:25581 (AD-A—090346)

Army Mobility Equipment Research and Development Command, Fort Belvoir, VA (USA)
Baseline tests of the Electra Van Model 1000 electric vehicle. Test report 20 Sep-28 Nov 78, 6:25877 (AD-A—090113)
Effects of low power microwaves on the local cerebral blood flow of conscious rats, 6:26398 (AD-A—090426)
The adsorption and electrooxidation of simple hydrocarbons for direct oxidation hydrocarbon-air fuel cells, 6:25662 (AD-A—090377)

Army Research and Technology Labs., Cleveland, OH (USA). Propulsion Lab.
The response of turbine engine rotors to interference rubs, 6:25855 (AD-A—090408)

Association of Bay Area Governments, Berkeley, CA (USA)
Application of photochemical models. Volume III. Recent sensitivity tests and other applications of the LIRAQ model. Final report, 6:26154 (PB—81-112898)

Atomic Industrial Forum, Inc., Washington, DC (USA)
Ecological investigations at power plant cooling lakes, reservoirs, and ponds: an annotated bibliography. Final report, 6:26324 (EPRI-EA—1874)
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)

Auburn Univ., AL (USA). Dept. of Chemical Engineering
Evaluation of a short-residence-time two-stage SRC process. Final report, 6:24861 (EPRI-AP—1827)

Automated Sciences Group, Inc., Silver Spring, MD (USA)
Support for the analytical tools for automotive fuel economy activities. Final report 30 Nov 77-1 Jul 80, 6:25867 (PB—81-109555)

Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.
Performance of passive-solar space-heating systems. Comparative report, 1979-1980 heating season, 6:25351 (SOLAR/0022—81/39)
Solar-energy-system performance evaluation: Dallas Recreation Center, Dallas, Texas. March-November 1980, 6:25352 (SOLAR/2038—81/14)

B

Babcock and Wilcox Co., Alliance, OH (USA). Contract Research Div.
Exhaust-fired fluid-bed combined cycle for power generation: preliminary feasibility study. Final report, 6:25442 (EPRI-CS—1818)

Babcock and Wilcox Co., Lynchburg, VA (USA). Nuclear Power Generation Div.
Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant, 6:25308 (SAND—80-8190)

Basin Electric Power Cooperative, Bismarck, ND (USA)
Feasibility study: utilization of power plant waste heat and other resources in a proposed oil sunflower seed processing plant. Final report, 6:25806 (PB—81-115792)

Battelle Columbus Labs., OH (USA)
Applications of fireside additives to utility boilers: workshop proceedings, 6:24958 (EPRI-WS—80-127)

Battelle Human Affairs Research Center, Seattle, WA (USA)
Nuclear waste management and environmental mediation: an exploratory analysis. Topical report, 6:25131 (PNL—3678)

Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation
Technical progress report for the quarter January 1-March 31, 1980, 6:25129 (ONWI—9(2)(80))

Battelle Pacific Northwest Labs., Richland, WA (USA)
Asphalt emulsion sealing of uranium mill tailings. 1980 annual report, 6:25133 (PNL—3752)
Assessing the local windfield with instrumentation, 6:25423 (PNL—3622)
Assessment of effectiveness of geologic isolation systems: geostatistical modeling of pore velocity, 6:25165 (PNL—3789)
Compressed air energy storage technology program. Annual report for 1980, 6:25573 (PNL—3804)
Correlations between pH and glass leaching, 6:25134 (PNL-SA—9102)
Design and performance of a full-scale spray calciner for nonradioactive high-level-waste-vitrification studies, 6:25132 (PNL—3742)
Nuclear waste management. Quarterly progress report, January-March, 1981, 6:25130 (PNL—3000-9)
Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2 supplement, ecological sciences, 6:26391 (PNL—3700Pt.2Suppl.)
Raptors of the Hanford Site and nearby areas of southcentral Washington, 6:26177 (PNL—3212)
Some aspects of fluctuating vertical wind shears, 6:25424 (PNL—3771)
Summary of comparative dual-ion-irradiation experiment on 316 stainless steel, 6:25909 (PNL-SA—9255)
Techniques for assessing the wind energy resource in the Southeast region, 6:25416 (PNL—3669)
Techniques for assessing the wind energy resource in the Southern Rocky Mountain region, 6:25417 (PNL—3671)
Techniques for assessing the wind energy resource in Hawaii and Pacific Islands region, 6:25419 (PNL—3673)
Techniques for assessing the wind energy resource in the Southwest region, 6:25418 (PNL—3672)
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)
Techniques for assessing the wind energy resource in the North Central region, 6:25414 (PNL—3667)
Water coning in porous media reservoirs for compressed air energy storage, 6:25572 (PNL—3470)

Bechtel National, Inc., San Francisco, CA (USA)
Cyclic reheat for FGD: status report. Final report, 6:25454 (EPRI-CS—1843)

Bell Labs., Murray Hill, NJ (USA)
Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}$P$_{16}$B$_6$Al$_3$ under extermal magnetic fields, 6:25897 (CONF-801134—16)

Bendix Corp., Kansas City, MO (USA)
ADVCON APT postprocessor, 6:26016 (BDX—613-2635)
CTBN variability study. Final report, 6:25944 (BDX—613-2565)
dc sputter gold deposition on beryllium-copper contacts, 6:26050 (BDX—613-2629)
Development of fracture toughness measurement capability by ultrasound. Final report, 6:26044 (BDX—613-2625)
Electrochemical deburring, 6:26014 (BDX—613-2594)
PTTOPT APT postprocessor, 6:26015 (BDX—613-2634)
Tester line voltage monitor, 6:25471 (BDX—613-2449)
Testing multilayer printed wiring board prepreg by differential-scanning calorimetry. Final report, 6:26049 (BDX—613-2626)
Training manual for precision hand deburring, Part 4, 6:26013 (BDX—613-2582)

Bendixen Associates, Boston, MA (USA)
Building energy-performance-standards conference: Proceedings. Strategy paper number 12, 6:25691 (CONF-800277—)

Boston Univ., MA (USA). Dept. of Chemistry
Organic photochemical storage of solar energy. Progress report, February 1, 1980-January 31, 1981, 6:25248 (DOE/ER/04380—T1)

Brigham Young Univ., Provo, UT (USA)
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)

Brookhaven National Lab., Upton, NY (USA)
Accelerator spallation reactors for breeding of fissile fuel and transmuting fission products, 6:26066 (BNL—29588)
Capabilities for research on acid rain, 6:26113 (BNL—29741)
Comments on the linear system for the self-dual Yang-Mills fields, 6:26566 (BNL—29548)
Description of the turbulent fragmentation of a puff in the turbulent flow with the large Reynold's numbers, 6:26104 (BNL—51385)
Effects of simulated acidic rainfalls on yields of field-grown radishes and garden beets, 6:26331 (BNL—29433)
Energy/economic model analysis. Time-stepped energy system optimization model. Final report, 6:25595 (PB—81-114241)
Evaluation of ^{232}Th for ENDF/B-V, 6:26595 (BNL-NCS—51360)
Evaluation of the conservation potential of a refit energy management system (using a power line subcarrier) in a large, high-rise apartment complex, 6:25690 (BNL—51299)
Evaluation of the simultaneous action of earthquake, LOCA and SRV on Mark-III containment and drywell structures, 6:25517 (BNL—29358)
Long-range oil and gas supply methodology: proposed reformulation, 6:25626 (BNL—51359)
Neutron scattering measurements of low-temperature hydrogen tunneling in niobium, 6:26608 (BNL—28332)
Potential role of district heating in the US, 6:25834 (BNL—29282)
Regional issue identification and assessment program (RIIA) Issue paper 2. Atmospheric long-range transport lead laboratory methodology, 6:26114 (BNL—51289)
Remarks on the description of the statistical features of the turbulent diffusion of a puff, 6:26105 (BNL—51386)
Semiannual report for the period April 1-September 30, 1980 of work on: (1) superconducting power transmission system development; and (2) cable insulation development, 6:25452 (BNL—51329)
Socioeconomic impacts of time-of-day pricing by electric utilities: a case study of Philadelphia residential customers, 6:25637 (BNL—51326)
Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$, 6:26583 (BNL—29658)
Storage in residential solar total-energy systems, 6:25389 (BNL—51230)
Technologies for the recovery and disposal of carbon dioxide, 6:26112 (BNL—29526)

Brown Boveri Compuguard Corp., Pittsburgh, PA (USA)
Field demonstrations of communication systems for distribution automation. Final report, 6:25474 (EPRI-EL—1860(Vol.2))

Buffalo Trace Area Development District, Maysville, KY (USA)
Synthetic fuels from eastern oil shale. Final report, 6:25084 (DOE/R4/10185—T1)

Burke, Davoud and Associates, Richmond, VA (USA)
Cannon shredding of municipal solid waste for the preparation of biological feedstock. Final report, 6:25837 (DOE/CE/20088—01)

C

California Dept. of Water Resources, Sacramento (USA)
Small hydroelectric potential at existing hydraulic structures in California. Appendixes: data and guidelines for development. Bulletin 211, 6:25207 (DOE/R9/10019—T1)
Small hydroelectric potential at existing hydraulic structures in California. Bulletin 211, 6:25208 (DOE/R9/10019—T2)
California Inst. of Tech., Pasadena (USA)
Reactor antineutrino spectra and their application to antineutrino-induced reactions II, 6:25501 (HEDL-SA—2303-FP)
California Solar Business Office, Sacramento (USA)
State incentives for passive solar commercialization, 6:25329 (DOE/CS/30245—T1)
California State Univ., Fullerton (USA)
Series-parallel solar-augmented rock-bed heat pump. Final report, 6:25338 (DOE/CS/34697—T3)
Series-parallel solar-augmented rock-bed heat pump. Convolution model of rock bed, 6:25390 (DOE/CS/34697—T1)
California Univ., Berkeley (USA). Dept. of Civil Engineering
Modeling of static mining subsidence in a nonlinear medium, 6:24934 (LBL—11896)
California Univ., Berkeley (USA). Dept. of Materials Science and Mineral Engineering
Performance of sodium-beta alumina solid electrolyte in Na/S cells, 6:25588 (LBL—12657)
California Univ., Livermore (USA). Lawrence Livermore Lab.
Flame propagation in gaseous fuel mixtures in semiconfined geometries, 6:25079 (UCID—19000)
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)
MORSE-C: a CDC-7600 program designed to solve nuclear criticality problems by using the Monte-Carlo method, 6:26025 (UCID—18993)
Oil shale project run summary, small retort runs S-21 and S-23, 6:25086 (UCID—19082)
Speech processing based on short-time Fourier analysis, 6:26729 (UCRL—86104)
California Univ., Livermore (USA). Lawrence Livermore National Lab.
Obtaining full operation for a large suite of neutral-beam injectors, 6:26713 (UCRL—86041)
California Univ., San Diego, La Jolla (USA). Dept. of Electrical Engineering and Computer Sciences
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Cal Recovery Systems, Inc., Richmond, CA (USA)
Feasibility study: utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamas County, Oregon, 6:25892 (DOE/RA/50366—T1)
Calspan Corp., Buffalo, NY (USA)
Vibrational energy-transfer kinetics in molecular disequilibrium. Progress report, 6:25978 (DOE/ER/10458—2)
Canby Area Vocational Technical Inst., MN (USA)
Enzymatic conversion of crop residue to glucose and alcohol, 6:25192 (DOE/R5/10131—2)
Capp (John P.), Morgantown, WV (USA)
Uncovering and evaluation of a twenty-five-year-old underground-coal-gasification burn at a site in Gorgas, Alabama, 6:24856 (DOE/MC/17783—T1)
Carnegie-Mellon Inst. of Research, Arlington, VA (USA). Energy Conservation Policy Center
Fuel-cell case study. Final report, 6:25663 (DOE/CS/20215—T1)
Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Civil Engineering
Biological removal of organic constituents in high-Btu coal gasification wastewaters, 6:24924 (CONF-8006171—1)
Carolina Power and Light Co., Raleigh, NC (USA)
Field demonstrations of communication systems for distribution automation. Final report, 6:25474 (EPRI-EL—1860(Vol.2))
Carrier Corp., Syracuse, NY (USA). Energy Systems Div.
Development of a high temperature solar powered water chiller. Volume I. Phase II: technical progress report, June 1, 1978-March 31, 1979, 6:25335 (DOE/CS/31590—)
Case Western Reserve Univ., Cleveland, OH (USA). Dept. of Physics
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Catalytic, Inc., Philadelphia, PA (USA)
Development of catalysts for coal conversion. Annual report for 1979, 6:24871 (PB—81-111395)
CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)
Experiments on vibration of heat-exchanger tube arrays in cross flow, 6:26020 (GA-A—16161)
Centec Corp., Fort Lauderdale, FL (USA)
Energy-efficient regeneration of granular activated carbon, 6:25801 (DOE/TIC—11124)
Centec Corp., Reston, VA (USA)
Energy-efficient regeneration of granular activated carbon, 6:25801 (DOE/TIC—11124)
Central Naugatuck Valley Regional Planning Agency, Waterbury, CT (USA)
Overcoming land-use barriers to solar access: solar planning recommendations for local communities, 6:25230 (DOE/TIC—1025039)
Charles River Associates, Inc., Boston, MA (USA)
Long-run price projections for uranium: an evaluation of methodologies. Final report, 6:25088 (CRA—79-313-S)
User-side subsidies for shared-ride taxis in Kinston, North Carolina. Final report, 6:25756 (UMTA-NC—06-0002-80-1)
Chevron Research Co., Richmond, CA (USA)
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report for the period October-December 1980 and annual summary for 1980, 6:24863 (FE—2315-60)
Chrysler Corp., Detroit, MI (USA)
Support services for the automotive-gas-turbine project, 6:25863 (DOE/NASA/0144—81/1)
Clemson Univ., SC (USA). Water Resources Research Inst.
Thermal effects on primary productivity of phytoplankton, periphyton and macrophytes in Lake Keowee, South Carolina. Report for 1 Jul 72-30 Jun 76, 6:25466 (PB—81-112435)
Cleveland-Cliffs Iron Co., Rifle, CO (USA)
Synthetic fuels from eastern oil shale. Final report, 6:25084 (DOE/R4/10185—T1)
Cleveland State Univ., OH (USA). Dept. of Physics
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Colorado School of Mines, Golden (USA)
Energy modeling. Volume II. Inventory and details of state energy models, 6:25592 (DOE/CS/10046—2(Vol.2))
Colorado School of Mines, Golden (USA). Research Inst.
State energy modeling. Volume I. An analysis of state energy modeling, 6:25591 (DOE/CS/10046—2(Vol.1))
Colorado State Univ., Fort Collins (USA). Dept. of Agricultural and Chemical Engineering
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw, 6:25406 (DOE/ID/12051—T1)
Colorado Univ., Boulder (USA)
Diagnostics of a glow discharge used to produce hydrogenated amorphous silicon films. Final report, February 15, 1980-April 14, 1981, 6:25264 (SERI/TR—9053-1-T3)
Columbia Gas System Service Corp., Columbus, OH (USA)
Haverhill solar energy project: economic analysis, 6:25330 (DOE/CS/30310—T1)
Haverhill solar energy project: preliminary design report, 6:25331 (DOE/CS/30310—T2)
Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory
Time-dependent transmissivity of joints. Progress report, July 1, 1980-June 30, 1981, 6:26425 (DOE/ER/04054—5)
Combustion Engineering, Inc., Chattanooga, TN (USA)
Studies on Section XI ultrasonic repeatability, 6:25503 (EPRI-NP—1858)
Combustion Power Co., Inc., Menlo Park, CA (USA)
Lignite combustion test project summary report. Test L-115, 6:24957 (DOE/FC/02030—T1)

Comstock and Wescott, Inc., Cambridge, MA (USA)
Extended development of a sodium hydroxide thermal-energy storage module, 6:25579 (DOE/NASA/0138—1)
Conoco, Inc., Stamford, CT (USA)
Demonstration plant engineering and design. Phase I: the pipeline gas demonstration plant. Volume 7. Plant Section 500 - shift/methanation, 6:24845 (DOE/ET/13060—T3(Vol.7))
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))
Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 2, overall plant, 6:24843 (DOE/ET/13060—T3(Vol.2))
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))
Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 13. Plant Section 1200, Phenol Extraction, 6:24847 (DOE/ET/13060—T3(Vol.13))
Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant, 6:24848 (DOE/ET/13060—T4)
Consolidated Controls Corp., El Segundo, CA (USA)
Lock hopper valves for coal gasification. Final report, 6:24842 (DOE/ET/10669—T7)
Coordinating Research Council, Inc., Atlanta, GA (USA)
Informational report: 1979 progress of the chemical characterization panel of the composition of diesel exhaust project and results of particulate extraction round-robin, 6:26158 (PB—81-114670)
Cornell Univ., Ithaca, NY (USA). Lab. of Nuclear Engineering
Importance theory for lumped-parameter systems, 6:25526 (HEDL-SA—2329-FP)

D

Dayton Univ., OH (USA). Research Inst.
Obtaining improved products from the organic fraction of municipal solid waste. Final report, 6:25843 (PB—81-110918)
Decision Analysis Corp., Annandale, VA (USA)
Alternative-fuel price trajectories: preparation of MFBI size/usage overlays and new boiler order analysis. Subtask 3.3. Final report, 6:25800 (DOE/RG/10446—T2)
Analysis of alternative-fuel price trajectories, 6:24969 (DOE/RG/10446—T1)
Decision Focus, Inc., Palo Alto, CA (USA)
Energy/economic model analysis. Energy economic modeling system. Final report, 6:25597 (PB—81-114274)
Department of Commerce, Boulder, CO (USA)
[Impact of Satellite Power Systems on the Ionosphere]. Final summary report, 6:25294 (DOE/CH/10003—1)
Department of Commerce, Boulder, CO (USA). Inst. for Telecommunication Sciences
Alternate frequency analysis for the solar power system, 6:25295 (DOE/ER/10160—T5)
Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center
Application of the BETC re-refining technology to some state-of-the-art commercial lube oils, 6:25046 (DOE/BETC/RI—81/1)
Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980, 6:25000 (DOE/BETC/IC—80/3(Vol.2))
Processing and utilization. Annual report, October 1, 1979-September 30, 1980, 6:25054 (DOE/BETC/IC—80/3(Vol.4))
Resource assessment. Annual report, October 1, 1979-September 30, 1980, 6:24975 (DOE/BETC/IC—80/3(Vol.1))
Department of Energy, Chicago, IL (USA). Chicago Operations Office
Gasohol by direct extraction of aqueous ferments. Interim progress report No. 1, 6:25191 (DOE/AF/92003—1)
Department of Energy, Las Vegas, NV (USA). Nevada Operations Office
Nevada Nuclear Waste Storage Investigations. Geologic and hydrologic investigation of Yucca Mountain: peer review documentation, 6:25127 (NVO—196-22)
Nevada Nuclear Waste Storage Investigations. Radionuclide migration in tuff and granite: peer review documentation, 6:25128 (NVO—196-23)
Department of Energy, London (UK)
International Energy Management Conference, 6:25674 (CONF-7910214—)
Department of Energy, Morgantown, WV (USA). Morgantown Energy Technology Center
Resource assessment of the eastern gas shales, 6:25067 (MLM—2831(OP))
Department of Energy, Washington, DC (USA)
Basic research needs and opportunities on interfaces in solar materials, 6:25232 (CONF-8006156—)
Department of Energy, Washington, DC (USA). Energy Information Administration
1980 EIA Publications Directory: a user's guide, 6:25599 (DOE/EIA—0149-80)
Cost and quality of fuels for electric utility plants: Energy data report. 1980 annual, 6:25632 (DOE/EIA—0191(80))
Inventory of power plants in the United States. 1980 annual, 6:25435 (DOE/EIA—0095(80))
Department of Energy, Washington, DC (USA). Office of Energy Research
Alternate fusion fuels workshop, 6:26687 (CONF-810141—(Absts))
Guide for the preparation of proposals for faculty development projects in energy education, 1982, 6:25850 (DOE/ER—0103)
Department of Energy, Washington, DC (USA). Office of Fusion Energy
Special Purpose Materials annual progress report, October 1, 1979, 6:25902 (DOE/ER—0048/1)
Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs
Steel plates for nuclear and other special applications (ASME SA-647 with additional requirements), 6:25498 (NE-M—5-23T(4/81)(Rev.))
Department of Energy, Washington, DC (USA). Office of Transportation Programs
Electric and hybrid vehicle program. Quarterly report, January-February-March 1981, 6:25880 (DOE/CE—0011/14)
Department of Housing and Urban Development, Washington, DC (USA). Office of Community Planning and Development
Block grant energy conservation, 6:25842 (PB—81-107575)
Department of Housing and Urban Development, Washington, DC (USA). Office of Policy Development and Research
New energy-conserving passive solar single-family homes. Cycle 5, Category 2 HUD solar heating and cooling demonstration program, 6:25346 (HUD-PDR—664)
Department of Transportation, Cambridge, MA (USA). Transportation Systems Center
Baseline fuel economy and emissions tests of a Chrysler 1978, 225 CID engine. Final report, 6:25866 (PB—81-105819)
Detroit Edison Co., MI (USA)
Field demonstrations of communication systems for distribution automation. Final report, 6:25475 (EPRI-EL—1860(Vol.3))
DHR, Inc., Washington, DC (USA)
Market assessment of photovoltaic power systems for agricultural applications in the Philippines, 6:25297 (DOE/NASA/0180—1)
Drexel Univ., Philadelphia, PA (USA)
Solar Atrium: a hybrid solar heating and cooling system, 6:25337 (DOE/CS/34135—T4)
Drexel Univ., Philadelphia, PA (USA). Dept. of Mechanical Engineering and Mechanics
Physical and chemical phenomena responsible for odor formation in diesel engines. Interim progress report Jul 78-Dec 79, 6:25874 (PB—81-119166)
Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.
Design guides for cell atmosphere controls, utilities and fire protection, 6:26317 (DP-MS—81-1)
Dispersion of radioactive pollutant in a tornadic storm, 6:26165 (DP—1556)
Environmental analysis burial of offsite low-level waste at SRP, 6:25124 (DPST—80-466)
Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant
Radiation stability of azo dyes in aqueous solutions, 6:26002 (DP-TR—19)

Duquesne Light Co., Shippingport, PA (USA)
[Shippingport Atomic Power Station]. Quarterly operating report, first quarter 1981, 6:25483 (DLCS—5000181)
Dynatech R/D Co., Cambridge, MA (USA)
Engineering economic analysis of biomethanation of pyrolysis gas, 6:25181 (DOE/CE/20098—1)
Performance characteristics of foamed-in-place urea formaldehyde insulation, 6:25721 (ORNL-SUB—78/86993/1)

E

ECP, Inc., El Segundo, CA (USA)
Crystallized fly-ash feasibility study. Final report, 6:25802 (EPRI-EL—1836)
EG and G Idaho, Inc., Idaho Falls (USA)
GEND planning report, 6:25525 (GEND—001)
Resistive demountable toroidal-field coils for tokamak reactors, 6:26705 (PPPL—1809)
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)
Small hydro plant development program, 6:25212 (DOE/ID/01570—T21(Vol.3)App.L)
Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region, 6:25522 (CONF-810801—3(Summ.))
EG and G, Inc., Goleta, CA (USA)
Radiation-to-light converters for nuclear environments: near-infrared emitters, 6:26083 (UCRL—85604)
Ehrenkrantz Group, New York (USA)
Identification of product and material differences in active solar systems, 6:25322 (ANL-K—81-74)
Electric Power Research Inst., Palo Alto, CA (USA)
GEND planning report, 6:25525 (GEND—001)
Results of full-scale turbine missile concrete impact experiments, 6:25538 (SAND—81-0353C)
Elmia AB, Joenkoeping (Sweden)
ELMIA-AVFALL 79, 6:25835 (CONF-7909198—)
EMCON Associates, San Jose, CA (USA)
Feasibility study: utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamas County, Oregon, 6:25892 (DOE/RA/50366—T1)
Energy and Environmental Analysis, Inc., Arlington, VA (USA)
Impact of fuel-economy information on new-car and light-truck buyers, 6:25754 (DOE/CS/58840—T1)
Energy Applications, Columbia, MD (USA)
Energy-efficiency directory of refrigerators and refrigerator-freezers, 6:25719 (DOE/CS/20315—T11)
Energy Concepts Co., Annapolis, MD (USA)
Air separation by the Moltox process. Interim final report, 6:25797 (DOE/CS/40287—T1)
Energy Research Corp., Danbury, CT (USA)
Evaluation of distributed gas cooling of pressurized PAFC for utility power generation. Second quarterly report, December 1980-February 1981, 6:25667 (DOE/NASA/0201—2)
High temperature molten carbonate fuel cells. Technical progress report, January-March 1979, 6:25664 (DOE/ET/11304—T12)
Energy Utilization Systems, Inc., Pittsburgh, PA (USA)
Demonstration of a heat-pump water heater, 6:25710 (CONF-810672—10)
Engineering-Science, Inc., Austin, TX (USA)
Efficacy of activated sludge/powdered activated carbon for removal of organic constituents in wastewater from commercial-scale, high-Btu coal gasification plant, 6:24925 (CONF-8006171—2)
Envirodyne Engineers, Inc., St. Louis, MO (USA)
Profile of air quality in Region V, 6:26171 (PB—81-116097)
Envirogenics Systems Co., El Monte, CA (USA)
Design study of the VTE boiler cycle for the desalination of sea water. Volume 1. Main report and Appendix A. Final report, 6:25449 (PB—81-113151)
Environmental Protection Agency, Ann Arbor, MI (USA)
Technical feasibility of the proposed 1982-1983 high altitude standards for light duty vehicles and light duty trucks. Technical report, 6:25873 (PB—81-118630)
The effects on measured emissions of a modified FTP (Federal Test Procedure) driving cycle. Technical report, 6:25884 (PB—81-103350)
Environmental Protection Agency, Las Vegas, NV (USA). Environmental Monitoring Systems Lab.
Animal Investigation Program: Nevada Test Site and Vicinity. Annual report, 1979, 6:26196 (DOE/DP/00539—042)
Selected radioisotopes in animal tissues in Nevada: ^{90}Sr and ^{137}Cs measurements from 1956 to 1977, 6:26195 (DOE/DP/00539—040)
Environmental Protection Agency, Las Vegas, NV (USA). Office of Radiation Programs
Animal Investigation Program: Nevada Test Site and Vicinity. Annual report, 1979, 6:26196 (DOE/DP/00539—042)
Selected radioisotopes in animal tissues in Nevada: ^{90}Sr and ^{137}Cs measurements from 1956 to 1977, 6:26195 (DOE/DP/00539—040)
Environmental Protection Agency, Research Triangle Park, NC (USA). Emission Standards and Engineering Div.
Automobile and light-duty truck surface coating operations-background information for promulgated standards. Final report, 6:26156 (PB—81-113920)
Environmental Protection Agency, Research Triangle Park, NC (USA). Office of Air Quality Planning and Standards
Ammonium sulfate manufacture - background information for promulgated emission standards. Final report, 6:26174 (PB—81-118747)
Guideline for use of city-specific EKMA in preparing ozone SIPS. Draft report, 6:26173 (PB—81-118739)
Source Test Data (SOTDAT) System information, 6:26107 (PB—81-120578)
Volatile organic compound (VOC) species data manual. Second edition, 6:26175 (PB—81-119455)
Environmental Research and Technology, Inc., Concord, MA (USA)
Techniques for assessing the wind energy resource in the Great Lakes region, 6:25415 (PNL—3668)
Environmental Research and Technology, Inc., Westlake Village, CA (USA)
The ELSTAR stationary source emissions data preprocessor. Software, 6:26157 (PB—81-114381)
ESCOR, Inc., Northfield, IL (USA)
Enhancement of methane gas production using an industrial waste in anaerobic digestion, 6:25179 (CONF-801210—26)
Preliminary evaluation of DOE-NEPA monitoring system, 6:26147 (DOE/EV/10475—1)
Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)
Process verification testing for burning TBP-containing organic solvents in the NWCF, 6:25125 (ENICO—1086)

F

Facilities Systems Engineering Corp., El Segundo, CA (USA)
Design guides for cell atmosphere controls, utilities and fire protection, 6:26317 (DP-MS—81-1)
Fermi National Accelerator Lab., Batavia, IL (USA)
Final beam emittances at the end of anti P-accumulation for the Fermilab anti P source, 6:26075 (DOE/CH/03000—T3)
Use of the ECL-CAMAC trigger processor system for recoil missing mass triggers at the Tagged Photon Spectrometer at Fermilab, 6:26077 (FERMILAB-Conf—81/40-EXP)
Filtrol Corp., Los Angeles, CA (USA)
Development of new catalysts for coal liquids refining. Sixth quarterly report, 1 April 1980-30 June 1980, 6:24864 (FE—2595-6)
Florida State Univ., Tallahassee (USA)
A characterization of faults in the Appalachian foldbelt, 6:26416 (NUREG/CR—1621)
Florida Univ., Gainesville (USA). Coll. of Engineering
Nuclear reactor maintenance technology assessment. Final summary report, September 16, 1978-September 15, 1979, 6:25499 (DOE/OR/06102—T1)
Florida Univ., Gainesville (USA). Dept. of Nuclear Engineering Sciences
Generation and identification of UIII lines. Annual report, 6:26453 (DOE/ET/33066—2)
Ford, Bacon and Davis Utah, Inc., Salt Lake City (USA)
Engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26197 (DOE/UMT—0102)

Engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25122 (DOE/UMT—0103)
Summary of the engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26198 (DOE/UMT—0102S)
Summary of the engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25123 (DOE/UMT—0103S)

Ford Motor Co., Dearborn, MI (USA). Research Staff
Ceramic regenerator systems development program. Final report, 6:25862 (DOE/NASA/0008—12)

Foster Associates, Inc., Washington, DC (USA)
A statistical study of coal sulfur variability and related factors. Final report, 6:24906 (PB—81-111585)
A statistical study of coal sulfur variability and related factors - documentation for the coal sulfur variability data base and analytical program. Final report, 6:24935 (PB—81-111593)

Foster Wheeler Corp., Livingston, NJ (USA)
Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 2, overall plant, 6:24843 (DOE/ET/13060—T3(Vol.2))
Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 13. Plant Section 1200, Phenol Extraction, 6:24847 (DOE/ET/13060—T3(Vol.13))

Foster Wheeler Energy Corp., Livingston, NJ (USA)
Demonstration plant engineering and design. Phase I: the pipeline gas demonstration plant. Volume 7. Plant Section 500 - shift/methanation, 6:24845 (DOE/ET/13060—T3(Vol.7))
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))

Franklin Pierce Law Center, Concord, NH (USA). Energy Law Inst.
Financing of private small scale hydroelectric projects: a summary guide, 6:25598 (DOE/CE/04934—46)

Franklin Research Center, Philadelphia, PA (USA)
Hot water from the sun: a consumer guide to solar water heating, 6:25344 (HUD-PDR—548)

Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Garmisch-Partenkirchen (Germany, F.R.). Inst. fuer Atmosphaerische Umweltforschung
Balance of the tropospheric ozone and its relation to stratospheric intrusions indicated by cosmogenic radionuclides. Technical progress report, November 1, 1980-June 30, 1981, 6:26143 (DOE/ET/03425—21)

G

Gas Recovery Systems, Inc., Pasadena, CA (USA)
Feasibility study: utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamas County, Oregon, 6:25892 (DOE/RA/50366—T1)

General Accounting Office, Washington, DC (USA)
Department of Energy's reorganization of Energy contingency planning holds promise - but questions remain, 6:25633 (EMD—81-57)
Special care needed in selecting projects for the Alternative Fuels Program, 6:25636 (EMD—81-36)

General Accounting Office, Washington, DC (USA). Energy and Minerals Div.
Oil savings from greater intertie capacity between the Pacific Northwest and California. Report to the Secretary of Energy, 6:25641 (PB—81-103392)

General Atomic Co., San Diego, CA (USA)
Accuracy of finite-element models for the stress analysis of multiple-holed moderator blocks, 6:25485 (GA-A—16234)
Assessment of long-term structural behavior of an asymmetric multi-cavity PCRV, 6:25486 (GA-A—16269)
Balmer alpha emission and hydrogen atom energy in ion-source discharges, 6:26703 (PPPL—1797)
Choice of coolant in commercial tokamak power plants, 6:26672 (CONF-801011—87)
Effect of couple-stress on the pure bending of a prismatic bar, 6:25946 (GA-A—16001)
Experiments on vibration of heat-exchanger tube arrays in cross flow, 6:26020 (GA-A—16161)
Lower-hybrid heating and current drive system for the STARFIRE tokamak, 6:26628 (CONF-801011—97)
Overview of the STARFIRE reference commercial tokamak fusion power reactor design, 6:26679 (CONF-801011—94)
Permissible-limit and flaw-size determination in an experimental fusion-reactor component, 6:26693 (GA-A—14847)
Simplified plotting package for the LSI-11 computer and Tektronix terminals, 6:26718 (GA-A—16148)
STARFIRE: a conceptual design of a commercial tokamak power plant. Paper IAEA-CN-39/E-1, 6:26667 (CONF-800707—26)
Strength of nonuniformly oxidized PGX graphite, 6:25948 (GA-A—16270)

General Electric Co., Cincinnati, OH (USA). Advanced Energy Programs
Pipeline bottoming-cycle study: technological feasibility of the bottoming cycle. Task IIIC report, 6:25823 (GESP—785)

General Electric Co., Cincinnati, OH (USA). Space Div.
Pipeline bottoming-cycle study: operational reliability and maintainability assessment, 6:25075 (GESP—813)

General Electric Co., Philadelphia, PA (USA)
Land biomass program. Annual report 1 Apr-31 Dec 79, 6:25254 (PB—81-113177)
Marine biomass program. Annual report 1 Jan-31 Dec 79, 6:25255 (PB—81-113185)

General Electric Co., Philadelphia, PA (USA). Advanced Energy Dept.
Solar central receiver heliostat mirror module development, 6:25306 (SAND—79-8189)

General Electric Co., Philadelphia, PA (USA). Space Div.
Medium-temperature air-heater development program. Final report, October 1, 1977-December 31, 1978, 6:25336 (DOE/CS/34126—T1)

General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.
Development of molten carbonate fuel-cell power plant. Quarterly technical progress report, August 1, 1980-October 31, 1980, 6:25665 (DOE/ET/17019—3)

General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.
Application of a Self-Actuating Shutdown System (SASS) to a Gas-Cooled Fast Reactor (GCFR), 6:25504 (DOE/SF/01435—T1)
Design criteria and candidate concept for high-performance cold trap, 6:25491 (DOE/SF/00893—T4)
Measures of radiological consequences in nuclear-reactor-safety assessments, 6:25524 (DOE/SF/71032—T10)
Plan for support of large-plant (post-CRBR) needs in large-leak sodium-water reaction area, 6:25523 (DOE/SF/70030—T19)
Status of prototype rupture disc testing in the large leak test rig, 6:25492 (DOE/SF/70030—T18)

Geomet Technologies, Inc., Gaithersburg, MD (USA)
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)

Georgetown Univ., Washington, DC (USA)
Industrial application of fluidized-bed combustion. Quarterly technical progress report, October-December, 1980, 6:26060 (DOE/ET/10381—150)

Georgia Inst. of Tech., Atlanta (USA)
Depletion analysis and sensitivity study of PHENIX fuel-irradiation experiments, 6:25489 (CONF-810606—56)
Reactor Sharing Program. Final program report for the period, July 1, 1979 through December 31, 1979, 6:25508 (DOE/ER/04206—T1)

Georgia Inst. of Tech., Atlanta (USA). Engineering Experiment Station
Pyrolytic oils - characterization and data development for continuous processing. Report for Jun 76-Mar 80, 6:25184 (PB—81-110959)

Georgia Univ., Athens (USA). Agricultural Research Center
Analysis of dielectric heating and conductive cooling of pyrite in coal, 6:24948 (IS-M—311)

Geothermal Power Corp., Novato, CA (USA)
Kelley Hot Spring Geothermal Project: Kelly Hot Spring Agricultural Center conceptual design, 6:25409 (GT—27041-4)

Giannotti and Associates, Inc., Annapolis, MD (USA)
Conceptual design study: cold water pipe systems for shelf-mounted OTEC powerplants. Final report, 6:25318 (DOE/NOAA/OTEC—36)
Grumman Aerospace Corp., Princeton, NJ (USA)
Ideal MHD beta-limits of poloidally asymmetric equilibria, 6:26639 (PPPL—1787)
Gulf Research and Development Co., Pittsburgh, PA (USA)
Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly progress report, September-November 1980, 6:24858 (DOE/PC/30080—T3)

H

Hagler, Bailly and Co., Washington, DC (USA)
Proceedings of second Franco-American conference on industrial energy conservation, 6:25763 (CONF-800272—)
Hamilton Test Systems, Inc., Phoenix, AZ (USA)
Testing support for evaluation of inspection/maintenance issues. (Test Group No. 1). Technical report, 6:25870 (PB—81-115081)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 2 and 5). Technical report, 6:25871 (PB—81-115099)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 3, 4 and 7). Technical report, 6:25872 (PB—81-115107)
Hanford Engineering Development Lab., Richland, WA (USA)
Assessment of the prevailing physics codes: LEOPARD, LASER, and EPRI-CELL, 6:25502 (HEDL-SA—2323)
Breached-pin testing in the US, 6:25495 (HEDL-SA—2405-FP)
Continuous-release formulation for environmental doses to moving receptors, 6:26166 (HEDL-SA—2302)
Cropped-Pin Transfer System for the Fuels and Materials Examination Facility, 6:25511 (HEDL-SA—2300)
Effectiveness of criticality safety technology, 6:25513 (HEDL-SA—2373-FP)
FFTF-containment air-cleaning system, 6:25509 (HEDL-SA—2105-FP)
Hot-cell verification facility, 6:25512 (HEDL-SA—2316-FP)
Importance theory for lumped-parameter systems, 6:25526 (HEDL-SA—2329-FP)
Reactor antineutrino spectra and their application to antineutrino-induced reactions II, 6:25501 (HEDL-SA—2303-FP)
Resource consequences of reenrichment versus blending, 6:25500 (HEDL-SA—2322-FP)
Rhenium muffle tube fabricated by CVD for application in 1800°C high thermal efficiency fuel processing furnace, 6:25904 (HEDL-SA—2137)
Secure automated fabrication: remote fabrication of breeder-reactor fuel, 6:25099 (HEDL-SA—2332-FP)
Thermal hydraulic analysis of the FFTF core usng SUPERENERGY-2, 6:25510 (HEDL-SA—2194)
Thermal hydraulics of handling FFTF fuel in sodium and argon, comparing test results with calculated, 6:25494 (HEDL-SA—2203-FP)
Harvard Univ., Cambridge, MA (USA). John Fitzgerald Kennedy School of Government
Outer-continental shelf oil and gas leasing policy, 6:25041 (DOE/PE/70278—T14)
Relaxing environmental standards during oil-supply disruptions: past, present and future, 6:26172 (DOE/PE/70278—T15)
Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry
Electronic excitation in molecular collisions: structural, dynamic and kinetic considerations. Annual summary report no. 2, Sep 79-Aug 80, 6:26445 (AD-A—090287)
Hemlock Semiconductor Corp., MI (USA)
Silicon materials task of the low-cost solar-array project. Phase IV. Effects of impurities and processing on silicon solar cells. Twenty-second quarterly report, January 1981-March 1981, 6:25250 (DOE/JPL/954331—81/14)
High Life Helicopters, Inc., Puyallup, WA (USA)
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle, Round Up quadrangle, Hardin quadrangle (Montana), Sheridan quadrangle, (Wyoming). Final report, 6:25092 (GJBX—179-81-Vol.1)
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle (Montana). Final report, 6:25093 (GJBX—179-81-Vol.2A)
Airborne gamma-ray spectrometer and magnetometer survey: Hardin quadrangle (Montana). Final report, 6:25094 (GJBX—179-81-Vol.2B)
Airborne gamma-ray spectrometer and magnetometer survey: Roundup quadrangle (Montana). Final report, 6:25096 (GJBX—179-81-Vol.2D)
Airborne gamma-ray spectrometer and magnetometer survey: Sheridan quadrangle (Wyoming). Final report, 6:25095 (GJBX—179-81-Vol.2C)
Airborne gamma-ray spectrometer and magnetometer survey: Jordan quadrangle, Miles City quadrangle, Glendive quadrangle (Montana), Watford City quadrangle, (North Dakota). Final report, 6:25097 (GJBX—180-81-Vol.1)
Hilo Coast Processing Co., Pepeekeo, HI (USA)
Solar production of intermediate-temperature process heat, phase I design. Preliminary design report, 6:25332 (DOE/CS/30311—T2)
Hughes Aircraft Co., Los Angeles, CA (USA). Space and Communications Group
High temperature bonding techniques for solar cell array. Final report Mar 76-Jun 77, 6:25293 (AD-B—028686/4)

I

IBM Federal Systems Div., Huntsville, AL (USA)
Solar energy system economic evaluation for IBM System 1B, Carlsbad, New Mexico. Final report, 6:25340 (DOE/NASA/CR—161730)
Idaho National Engineering Lab., Idaho Falls (USA)
Advanced mobile multi-processor gamma-ray acquisition and analysis system. Topical report, 6:26080 (NUREG/CR—1668)
In-plant source term measurements at Turkey Point Station - Units 3 and 4. Topical report, 6:25536 (NUREG/CR—1629)
Small hydro plant development program. Volume 1. Text, 6:25209 (DOE/ID/01570—T21(Vol.1))
Surface finish effects on the high-cycle fatigue of Alloy 718, 6:25903 (EGG-M—01981)
IIT Research Inst., Chicago, IL (USA)
rf heating of Utah tar sands. Final report, October 1978-December 1979, 6:25083 (DOE/CH/90035—4)
Illinois Central Coll., East Peoria (USA)
Alternate Home Energy Application and Demonstration: Project AHEAD. Final report, 6:25342 (DOE/R5/10112—T1)
Illinois State Geological Survey, Urbana (USA)
Chemical and biological characterization of leachates from coal solid wastes. Final report Sep 76-Jun 79, 6:24930 (PB—81-114043)
Illinois Univ., Urbana (USA)
Free and forced convective cooling of pipe-type electric cables. Volume 1: forced cooling of cables. Final report, 6:25478 (EPRI-EL—1872)
Free and forced convective cooling of pipe-type electric cables. Volume 2: electrohycrodynamic pumping. Final report, 6:25479 (EPRI-EL—1872(Vol.2))
Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)
Two-dimensional modeling of the oceans and CO_2 uptake, 6:26289 (UCRL—85673)
Illinois Univ., Urbana (USA). Dept. of Mechanical and Industrial Engineering
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 3. Plume rise from mechanical draft cooling towers. Technical report, 6:25461 (NUREG/CR—1581-V-3)
Illinois Univ., Urbana (USA). Dept. of Nuclear Engineering
Identification of noise in linear data sets by factor analysis, 6:25966 (DOE/EV/10403—2)
Indiana Univ., Bloomington (USA). School of Public and Environmental Affairs
Toxic organic compounds from energy production, 6:26146 (DOE/EV/10449—T1)

Input Output Computer Services, Inc., Washington, DC (USA)
Financial aspects of coal transportation by rail. Final report Oct 78-Sep 79, 6:24951 (PB—81-110868)

Insights West, Inc., Los Angeles, CA (USA)
Solar industrial process heat: a study of applications and attitudes. Final report, 6:25350 (SERI/TR—98348-1)

Institute of Gas Technology, Chicago, IL (USA)
Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)
Evaluation of coal conversion catalysts. Annual report, 6:24870 (PB—81-111387)
Fuel cell support studies: on-site molten carbonate systems. Final report 1 Dec 78-30 Nov 79, 6:25672 (PB—81-113672)
High-temperature high-pressure particulate removal in coal gasification. Final report 1 Sep 78-1 Jan 80, 6:24938 (PB—81-113664)
Hydrogasification of oil shale. Final report Jan 72-Dec 79, 6:25085 (PB—81-114092)
Rapid-rate bituminous coal gasification. Annual report 1 Jan-31 Dec 79, 6:24872 (PB—81-114290)
Research, development, and demonstration of a high-efficiency gas fired water heater. Final report 1979-80, 6:25724 (PB—81-113656)

International Business Machines Corp., Hopewell Junction, NY (USA). East Fishkill Lab.
Determination of uranium and thorium in semiconductor memory materials by high fluence neutron activation analysis, 6:25965 (CONF-810682—3)

International Coal Refining Co., Allentown, PA (USA)
Kentucky Department for Natural Resources and Environmental Protection: permit application for air contaminant source. Supplement II, 6:24857 (DOE/OR/03054—T5)

Interstate Electronics Corp., Anaheim, CA (USA). Oceanics Div.
Preliminary evaluation of impingement and entrainment by ocean thermal energy conversion (OTEC) plants, 6:25319 (LBL—11833)

Iowa State Univ. of Science and Technology, Ames (USA)
Sorption of pollutant gases by soils. Final report, December 1, 1974-November 30, 1980, 6:26191 (DOE/EV/02530—17)

Iowa State Univ. of Science and Technology, Ames (USA). Dept. of Chemical Engineering
Assessment of the environmental impact of power plant fly ash, 6:24933 (IS-M—309)

ITINTEC, Lima (Peru). Div. de Energia
Development of solar energy in Peru, 6:25219 (SAND—81-0764)

J

Japan Industrial Technology Association, Tokyo
Interregional symposium on solar energy for development. 6:25216 (CONF-790203—)

JAYCOR, Alexandria, VA (USA)
Electron and ion flows in diodes. Final report 19 Mar 79-18 Jun 80, 6:26444 (AD-A—089736)

Johns Hopkins Univ., Baltimore, MD (USA)
Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ under extermal magnetic fields, 6:25897 (CONF-801134—16)

Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.
Environmental assessment of cooling tower drift and vapor emissions for the proposed Vienna Unit No. 9, 6:25450 (PB—81-119737)
Land use and development trends in Dorchester and Wicomico counties, 6:25464 (PB—81-110249)
Prediction of air quality impacts for stack emissions from the proposed Vienna unit No. 9, 6:25463 (PB—81-109720)
Prediction of socio-economic impacts by the proposed unit No. 9 at Vienna and alternative sites, 6:25448 (PB—81-110256)
Spark discharge characteristics of vehicles energized by ac electric fields, 6:25869 (PB—81-114720)

Joint Publications Research Service, Arlington, VA (USA)
East Europe report: scientific affairs, No. 706, 6:26715 (JPRS—78269)

Jorgenson (Dale W.) Associates, Cambridge, MA (USA)
Energy/economic model analysis. Macroeconomic impacts of research and development in gas supply and end use technologies. Final report, 6:25066 (PB—81-114258)

K

Kaiser Aluminium and Chemical Corp., Pleasanton, CA (USA)
Energy savings through the use of an improved aluminum reduction-cell cathode. Technical progress report, April 1, 1980-June 30, 1980, 6:25796 (DOE/CS/40215—T1)

Katzen (Raphael) Associates, Cincinnati, OH (USA)
Farm and cooperative alcohol plant study: technical and economic assessment as a commercial venture, 6:25195 (PB—81-112641)

Kentucky Univ., Lexington (USA)
Production of beef with minimum grain and fossil energy inputs. Volume III. Input forms for the model. Final report, 6:25805 (PB—81-113706)

Kentucky Univ., Lexington (USA). Dept. of Chemistry
Electron photoejection in carbanions. Progress report, July 1, 1980-June 30, 1981, 6:25998 (DOE/ER/10424—1)

Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research
Synthetic fuels from eastern oil shale. Final report, 6:25084 (DOE/R4/10185—T1)

KVB, Inc., Irvine, CA (USA)
Inventory of emissions from boating sources in California. Final report, 6:26152 (PB—81-111460)

L

Lawrence Berkeley Lab., CA (USA)
Characteristics of an NH_3-air fuel cell system for vehicular applications, 6:25671 (LBL—12754)
Chemical makeup of Nb and Nb_3Sn films, 6:25983 (SAND—81-0969C)
Computer program CCC: user's manual, 6:26475 (LBL—10909)
Critical analysis of the electron gyrorelaxation heating device in the AMBAL facility, 6:26663 (UCRL-Trans—11689)
Energy savings with solid-state ballasted high-pressure sodium lamps, 6:25841 (LBL—12595)
Experimental evidence and theoretical implications of fluctuations in deep inelastic heavy ion collisions, 6:26574 (LBL—12596)
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)
Higgs phase in non-Abelian gauge theories, 6:26521 (LBL—12840)
Mass spectrometry with a very small cyclotron, 6:26071 (LBL—12797)
Performance of sodium-beta alumina solid electrolyte in Na/S cells, 6:25588 (LBL—12657)
Preliminary evaluation of impingement and entrainment by ocean thermal energy conversion (OTEC) plants, 6:25319 (LBL—11833)
Soot in urban atmospheres, 6:26148 (LBL—10881)
Soot volume-fraction profiles in a free-combusting boundary layer, 6:26011 (LBL—12767)
Status and problems of semiconductor detectors, 6:26079 (LBL—12380)
Third invitational well-testing symposium: well testing in low permeability environments, 6:26404 (LBL—12076)
Topics in the theory of heavy-quark systems, 6:26520 (LBL—12558)
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Ventilation requirements for control of occupancy odor and tobacco smoke odor: laboratory studies. Final report, 6:26400 (LBL—12589)

Lawrence Livermore National Lab., CA (USA)
Adaptive-mesh zoning by the equipotential method, 6:26627 (UCID—19062)

Analysis of the operation of Occidental's Modified In-Situ Retort 6, 6:25087 (UCRL—85312)
Calibration of peizoresistive gauges, 6:26092 (UCRL—86285)
Causes of CO_2-induced sensitivity in a zonal climate model, 6:26163 (UCRL—85754)
Comparison of molecular-dynamics calculations with observed initiation phenomena, 6:26099 (UCRL—85187)
Detection of water-filled and air-filled underground cavities, 6:26420 (UCRL—53127)
Electron-cyclotron-resonant-heated electron distribution functions, 6:26645 (UCRL—85826)
Electrostatic air filters generated by electric fields, 6:26162 (UCRL—84878)
Energy/economic model analysis. Livermore energy policy model. Final report, 6:25596 (PB—81-114266)
Environmental monitoring at the Lawrence Livermore National Laboratory: 1980 annual report, 6:26200 (UCRL—50027-80)
Evaluation of organic peroxides as curing agents for methylphenylvinyl-siloxane elastomers used for cellular silicone cushions, 6:25941 (UCRL—53124)
Evaluation of the seismic integrity of a plutonium-handling facility, 6:25170 (UCRL—85458)
Future possibilities for energy-storage automobiles, 6:25881 (UCRL—85902)
Impact of the January-February 1980 earthquake sequence on various structures at the Lawrence Livermore National Laboratory, 6:25171 (UCRL—85460)
Large-acceptance-angle gridded analyzers in an axial magnetic field, 6:26644 (UCRL—52981)
Portable computer to reduce gamma-ray spectra for plutonium isotopic ratios, 6:25174 (UCRL—53145)
Program report for FY 1980. Atmospheric and Geophysical Sciences Division of the Physics Department, 6:26161 (UCRL—51444-80)
Psuedo-3D, isodensity and density profiles from fiber optic output of a MACH-130 air shock, 6:26091 (UCRL—85655)
Radiation-to-light converters for nuclear environments: near-infrared emitters, 6:26083 (UCRL—85604)
Railguns for equation-of-state research, 6:26026 (UCRL—85298)
Setting up a photographer to do a good job, 6:26714 (UCRL—86304)
Specifications for the Linear Charge Coupled Device for use in transient recording, 6:26052 (UCID—19048)
Structure-property relations of Kevlar 49 fibers, 6:25942 (UCRL—85744)
Theoretical investigation of a 10-μm free-electron laser amplifier using a 50-MeV multi-kA electron beam, 6:26033 (UCRL—85653)
Theoretical studies of shock dynamics in two-dimensional structures. V. Microscopic constraints on shock-induced signals, 6:26615 (UCRL—85288)
Two-dimensional modeling of the oceans and CO_2 uptake, 6:26289 (UCRL—85673)
Why you see what you see looking down at an underground explosion, 6:26102 (UCID—19031)

Lehigh Univ., Bethlehem, PA (USA)
Program evaluation and review system for the Division of Energy Storage Systems. Final report, July 1, 1977-May 31, 1981, 6:25616 (DOE/ET/26704—7)

Little (Arthur D.), Inc., Cambridge, MA (USA)
Solar heating and cooling (SHAC) simulation programs: assessment and evaluation. Volume 2. Detailed findings. Final report, 6:25343 (EPRI-EM—1866(Vol.2))

Lockheed Missiles and Space Co., Sunnyvale, CA (USA). Ocean Energy Systems
Ocean thermal energy conversion power system development-II. Phase II. Final design report, 6:25316 (DOE/ET/21056—T3)

Lockman and Associates, Monterey Park, CA (USA)
Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, Glendale, California. Final report, 6:25838 (DOE/CE/20237—1)

Long Island Lighting Co., Hicksville, NY (USA)
Field demonstrations of communication systems for distribution automation. Final report, 6:25476 (EPRI-EL—1860(Vol.4))

Los Alamos National Lab., NM (USA)
Acceptability of reactors in space, 6:25527 (LA-UR—81-1371)
Calculations of cratering experiments with the bedded crack model, 6:25080 (LA-UR—81-1659)
Comparisons of TRAC-PD2 calculations with Semiscale Mod-3 small-break tests, 6:25530 (LA-UR—81-1520)
Design considerations for vehicular fuel cell power plants, 6:25670 (LA-UR—81-1054)
Development of man-made geothermal reservoirs, 6:25399 (LA-UR—81-852)
Hot dry rock geothermal energy development program. A progress report, 6:25400 (LA-UR—81-1265)
Improved efficiency in the sulfur dioxide-iodine hydrogen cycle through the use of magnesium oxide, 6:25177 (LA-UR—81-1050)
Influences on target irradiation symmetry in CO_2 laser-fusion experiments, 6:26698 (LA-UR—81-1566)
Internal resistive initiation coil electromagnetics in the FED/INTOR baseline design, 6:26633 (LA—8784-MS)
10-joule high-voltage trigger micro Marx, 6:26699 (LA-UR—81-1641)
Metafile for efficient sequential and random display of graphics, 6:26720 (LA-UR—80-3642)
Muon states in the antiferromagnetic oxides α-Fe_2O_3 and $FeTiO_3$, 6:25950 (LA-UR—81-1017)
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear, 6:26634 (LA—8828-MS)
Photoemission measurements for low energy x-ray detector applications, 6:26609 (LA-UR—81-1712)
Pretest and posttest calculations of Semiscale Test S-07-10D with the TRAC computer program, 6:25532 (LA-UR—81-1556)
Railguns for equation-of-state research, 6:26026 (UCRL—85298)
Satellite graphics output station, 6:26721 (LA-UR—80-3716)
Special small-break applications with TRAC, 6:25529 (LA-UR—81-1519)
Spectroscopy and mass measurements of neutron rich isotopes by the (t,α) reaction, 6:26590 (LA-UR—81-1721)
TRAC methods and models, 6:25528 (LA-UR—81-1498)
TRAC-PD2 modeling of LOFT and PWR small cold-leg breaks, 6:25531 (LA-UR—81-1521)
Ultraprecision machining of optics at Los Alamos, 6:26021 (LA-UR—81-1962)

Los Alamos Scientific Lab., NM (USA)
Design and fabrication of a high-damage threshold infrared Smattt interferometer, 6:26696 (LA-UR—81-1395)
Development of a quality-assurance program for the Tritium Systems Test Assembly, 6:26697 (LA-UR—81-1416)
Epoxy replication for Wolter x-ray microscope fabrication, 6:26636 (LA-UR—81-1611)
Illustrator's view of more-effective technical communication through computer graphics, 6:26719 (LA-UR—80-3457)
Internal magnetic probe data from ZT-40, 6:26694 (LA—8753MS)
Materials for magnetic refrigeration between 2 and 20 K, 6:25949 (LA—8746-MS)
Nuclei far from stability using exotic targets, 6:26589 (LA-UR—81-1593)
Pulse power applications of flux compression generators, 6:26635 (LA-UR—81-1601)
Reckoning THOR, 6:25514 (LA—8856-MS)
Remote detection system, 6:26078 (LA—8814-MS)
Superconducting solenoid designed for 400 kJ at 25 kA under conditions of fast discharge and field reversal, 6:26695 (LA—8829-MS)

M

Manhattan Coll., New York (USA). Lab. for Plant Morphogenesis
Effects of simulated acidic rainfalls on yields of field-grown radishes and garden beets, 6:26331 (BNL—29433)

Market Facts, Inc., Washington, DC (USA)
Solar Audience Test summary report. Task Assignment No. 3, 6:25217 (DOE/CS/10070—T1)

Martini Engineering, Richland, WA (USA)
Computer simulation of the transient response of a 4 cylinder Stirling engine with burner and air preheater in a vehicle, 6:25875 (DOE/NASA/0226—1)

Martin Marietta Corp., Denver, CO (USA)
Second-generation heliostat development. Volume 1. Detailed design report, 6:25307 (SAND—79-8192/1)

Martin Marietta Corp., Denver, CO (USA). Denver Div.
Hazard analysis for 10 MW/sub e/ solar thermal central receiver pilot plant. Supplement 1. Final report, 6:25303 (MCR—78-1331A)
Martin Marietta Labs., Baltimore, MD (USA)
Photochemistry and enzymology of photosynthesis. Progress report, November 1, 1978-May 31, 1981, 6:26308 (DOE/ER/03326—101)
Maryland Univ., Solomons (USA). Chesapeake Biological Lab.
Chalk Point steam electric station studies Patuxent Estuary studies: ichthyoplankton population studies, 1979. Final report, 6:25465 (PB—81-111312)
Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)
Computer program for storage and retrieval of thermal-stability data for explosives, 6:26098 (MHSMP—81-29)
Study for compacting the explosive LX-17, 6:26097 (MHSMP—81-28)
Massachusetts Inst. of Tech., Cambridge (USA)
Functional requirements for fusion reactor first walls. Status report No. MITNRL-002, 6:26692 (DOE/ER/10107—2)
Thermoeconomics of energy systems. Progress report, June 1, 1980-May 30, 1981, 6:25799 (DOE/ER/10518—2)
Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Earth and Planetary Sciences
Microcracks and energy. Progress report, April 1, 1980-February 28, 1981, 6:25089 (DOE/ER/04972—1)
Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.
Coal-devolatilization information for reactor modeling: assessment of data and apparatus availability with recommendations for research. Final report, 6:24860 (EPRI-AP—1803)
Massachusetts Inst. of Tech., Cambridge (USA). Lab. of Architecture and Planning
Tests for thermal efficiency of dwellings. Final report, 6:25722 (PB—81-105736)
Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Analysis and test of line-commutated inverters for use in photovoltaic power systems, 6:25296 (DOE/ET/20279—115)
Testing and evaluation of a solar photovoltaic flywheel energy storage system, 6:25578 (DOE/ET/20279—130)
Maurer Engineering, Inc., Houston, TX (USA)
Evaluation of equipment and methods to map lost circulation zones in geothermal wells, 6:25403 (SAND—80-7057)
McDermott, Inc., New Orleans, LA (USA)
Conceptual design study: cold water pipe systems for shelf-mounted OTEC powerplants. Final report, 6:25318 (DOE/NOAA/OTEC—36)
McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)
Failure modes and effects analysis (RADL Item 2-23), 6:25299 (DOE/SF/10499—T30)
Heat and mass balance design analysis (RADL Item 2-15), 6:25301 (DOE/SF/10499—T33)
10-MWe Solar-thermal central-receiver pilot plant: solar-facilities design integration. Beam-characterization subsystem targets procurement documentation (RADL item 7-43), 6:25300 (DOE/SF/10499—T31)
10-MWe Solar-Thermal Central-Receiver Pilot Plant: solar-facilities design integration. BCS hardware and software specification (RADL item 3-2), 6:25305 (SAN—0499-53)
Pilot-plant startup and acceptance-test plan (RADL Item 2-46). 10-MWe solar-thermal central-receiver pilot plant. Solar-facilities design integration, 6:25304 (MDC-G—9330)
McDonnell Douglas Astronautics Co., St. Louis, MO (USA)
Limiter/vacuum system for plasma impurity control and exhaust in tokamaks, 6:26681 (CONF-801011—96)
Lower-hybrid heating and current drive system for the STARFIRE tokamak, 6:26628 (CONF-801011—97)
Overview of the STARFIRE reference commercial tokamak fusion power reactor design, 6:26679 (CONF-801011—94)
Quality-assurance approach for the Elmo Bumpy Torus Proof-of-Principal experiment, 6:26688 (CONF-810654—2)
STARFIRE: a conceptual design of a commercial tokamak power plant. Paper IAEA-CN-39/E-1, 6:26667 (CONF-800707—26)
STARFIRE burn cycle, 6:26674 (CONF-801011—89)
McDonnell Douglas Electronics Co., St. Charles, MO (USA)
Power shovel data accumulator and display, 6:24943 (DOE/PC/30205—T1)
McIver Consultants International, Houston, TX (USA)
Resource assessment of the eastern gas shales, 6:25067 (MLM—2831(OP))
McKee (Davy) Corp., Cleveland, OH (USA)
Synthetic fuels from eastern oil shale. Final report, 6:25084 (DOE/R4/10185—T1)
McKinsey and Co., Inc., New York (USA)
Fuel-cell case study. Final report, 6:25663 (DOE/CS/20215—T1)
McMullen (John J.) Associates, Inc., New York (USA)
National petroleum reserve - Alaska: marine transportation system analysis. Executive summary, 6:25048 (PB—81-105033)
National petroleum reserve - Alaska: marine transportation system analysis. Final report, 6:25049 (PB—81-105041)
Meteorology Research, Inc., Altadena, CA (USA)
Application of computer graphics to air quality data analysis. Technical report, 6:26155 (PB—81-113623)
Michigan State Univ., East Lansing (USA)
Response of a forest ecotone to ionizing radiation. Progress report, October 15, 1980-October 14, 1981, 6:26315 (DOE/EV/02283—2)
Michigan State Univ., East Lansing (USA). Dept. of Botany and Plant Pathology
Differential effects of growth and loss processes in controlling natural phytoplankton populations, 6:26208 (DOE/EV/01599—T1(Pt.3))
Littoral-pelagial interactions: the role of dissolved humic materials, 6:26209 (DOE/EV/01599—T1(Pt.4))
Michigan State Univ., East Lansing (USA). Inst. of Water Research
Effect of fluctuating reservoir release on the downstream environment, 6:26288 (PB—81-115677)
Michigan State Univ., Hickory Corners (USA). W.K. Kellogg Biological Station
Dissolved organic matter and lake metabolism: biogeochemistry and controls of nutrient flux dynamics in lakes. Technical progress report, 1 July 1980-1 June 1981, 6:26207 (DOE/EV/01599—T1(Pt.1))
Publications of the Lawrence Lake ecosystem investigations, 6:26210 (DOE/EV/01599—T1(Pt.5))
Michigan Univ., Ann Arbor (USA). Gas Dynamics Labs.
Initiation of detonation in unconfined natural gas-air clouds Final report, 6:25071 (PB—81-113292)
Minnesota Univ., St. Paul (USA). Underground Space Center
Earth shelter 2. 1979-1980 USC Series, 6:25692 (CONF-800438—)
Mississippi-Alabama Sea Grant Consortium, Ocean Springs, MS (USA)
The economic and environmental structure of Alabama's coastal region, part II. Environmental structure, 6:25601 (PB—81-113391)
Waste disposal inventory for Mississippi-Alabama coastal counties, 6:26160 (PB—81-118994)
Mohawk Coll., Hamilton, Ontario (Canada)
Solar data base management system, 6:25326 (CONF-800804—40)
Montana Dept. of Natural Resources and Conservation, Helena (USA)
Montana Geothermal Handbook: a guide to agencies, regulations, permits and financial aids for geothermal development, 6:25392 (DOE/ID/12014—T1)
Montana State Univ., Bozeman (USA). Fisheries Bioassay Lab.
Environmental effects of western coal combustion. Part III. The water quality of Rosebud Creek, Montana. Final report, 6:24937 (PB—81-113615)
Mound Facility, Miamisburg, OH (USA)
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Computerized waste-accountability shipping and packaging system, 6:25102 (MLM—2842(OP))
Gamma-ray measurements for simultaneous calorimetric assay, 6:25969 (MLM—2840(OP))
GRPAUT: a computer code for automated isotopic analysis of plutonium spectra, 6:26722 (MLM—2841(OP))
Pricetown I underground coal gasification field test: operations report, 6:24869 (MLM-MU—81-62-0007)
Quadrupole interactions in liquid and solid deuterium, 6:25981 (MLM—2817(OP))
Resource assessment of the eastern gas shales, 6:25067 (MLM—2831(OP))
Muenchen Univ. (Germany, F.R.)
Neutron scattering measurements of low-temperature hydrogen tunneling in niobium, 6:26608 (BNL—28332)

N

National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center
Ceramic regenerator systems development program. Final report, 6:25862 (DOE/NASA/0008—12)
Combustion-system processes leading to corrosive deposits, 6:26010 (DOE/NASA/2593—27)
Effects of fuel-injector design on ultra-lean combustion performance, 6:25864 (DOE/NASA/51040—26)
Evaluation of distributed gas cooling of pressurized PAFC for utility power generation. Second quarterly report, December 1980-February 1981, 6:25667 (DOE/NASA/0201—2)
Extended development of a sodium hydroxide thermal-energy storage module, 6:25579 (DOE/NASA/0138—1)
Lightning-accommodation systems for wind-turbine-generator safety, 6:25421 (DOE/NASA/20320—31)
Market assessment of photovoltaic power systems for agricultural applications in the Philippines, 6:25297 (DOE/NASA/0180—1)
MHD channel study for the ETF conceptual design, 6:25651 (DOE/NASA/10769—14)
NASA preprototype redox storage system for a photovoltaic stand-alone application, 6:25669 (DOE/NASA/12726—8)
Non-noble catalysts and catalyst supports for phosphoric-acid fuel cells. 2nd quarterly report, December 1980-February 1981, 6:25668 (DOE/NASA/6229—2)
Overview: DOE/NASA automotive gas turbine and Stirling projects, 6:25865 (DOE/NASA/51040—28)
System safety in Stirling engine development, 6:25876 (DOE/NASA/51040—25)

National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center
Initial assessment of the effects of energetic-ion injections in the magnetosphere due to the transport of satellite-power-system components from low earth orbit to geosynchronous earth orbit, 6:26436 (DOE/CH/10048—1)

National Aeronautics and Space Administration, Washington, DC (USA)
Solar energy system economic evaluation for IBM System 1B, Carlsbad, New Mexico. Final report, 6:25340 (DOE/NASA/CR—161730)

National Bureau of Standards, Washington, DC (USA)
Neutron scattering measurements of low-temperature hydrogen tunneling in niobium, 6:26608 (BNL—28332)
Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980, 6:25720 (NBSIR—80-2145(DOE))

National Bureau of Standards, Washington, DC (USA). Metallurgy Div.
Non-noble catalysts and catalyst supports for phosphoric-acid fuel cells. 2nd quarterly report, December 1980-February 1981, 6:25668 (DOE/NASA/6229—2)

National Conference of State Legislatures, Denver, CO (USA)
Geothermal policy project. Quarterly report, November 1, 1979-January 31, 1980, 6:25407 (DOE/SF/01795—T2)

National Highway Traffic Safety Administration, Washington, DC (USA). Technical Services Div.
Inspection, maintenance and repair of motor vehicles. Subject bibliography, 6:25868 (PB—81-109761)

National Inst. for Occupational Safety and Health, Cincinnati, OH (USA)
Health hazard evaluation determination report no. HE 79-31-699, University Corporation for Atmospheric Research, Mauna Loa Observatory, Hilo, Hawaii 96720, 6:26151 (PB—81-111247)
Technical assisTAnce report ta 80-33, Omaha waste pretreatment plant, omaha, Nebraska, 6:26150 (PB—81-111148)

National Oceanic and Atmospheric Administration, Washington, DC (USA)
Report to the Congress on ocean pollution and offshore development, October 1977 through September 1978. Annual report No. 6, 6:26298 (PB—81-118333)

National Power Plant Team, Ann Arbor, MI (USA)
Cooling water intake screening devices used to reduce entrainment and impingement. Topical briefs: fish and wildlife resources and electric power generation, No. 9, 6:25468 (PB—81-116055)

National Research Council, Washington, DC (USA)
Controlling airborne particles, 6:26106 (PB—81-114969)

National Research Council, Washington, DC (USA). Committee on Dielectrics
Experimental techniques for investigating the degradation of electrical insulation. Final report, 6:25473 (EPRI-EL—1854)

National Research Council, Washington, DC (USA). Committee on Nuclear and Alternative Energy Systems
Energy choices in a democratic society. Supporting paper 7, 6:25602 (PB—81-114852)
Sociopolitical effects of energy use and policy. Supporting paper 5, 6:25603 (PB—81-114894)

National Technical Information Service, Springfield, VA (USA)
Energy policy and research planning. October, 1977-September, 1980 (Citations from the NTIS Data Base). Report for Oct 77-Sep 80, 6:25631 (PB—81-800112)
Nitrogen oxide air pollution: biological effects. 1964-August, 1980 (citations from the NTIS data base). Report for 1964-Aug 80, 6:26390 (PB—81-800203)

Naval Weapons Center, China Lake, CA (USA). Michelson Labs.
Chemical makeup of Nb and Nb_3Sn films, 6:25983 (SAND—81-0969C)
Preparation and characterization of hydrogenated amorphous silicon. Quarterly progress report No. 7, 1 December-28 February 1981, 6:25258 (SERI/PR—8142-4-T2)

Nebraska Univ., Lincoln (USA)
Theoretical studies of shock dynamics in two-dimensional structures. V. Microscopic constraints on shock-induced signals, 6:26615 (UCRL—85288)

Nebraska Univ., Lincoln (USA). Behlen Lab. of Physics
Comparison of molecular-dynamics calculations with observed initiation phenomena, 6:26099 (UCRL—85187)

Nebraska Univ., Lincoln (USA). Dept. of Chemistry
Studies on unusually reactive metal powders. Preparation on new organometallic and organic compounds including potential new catalysts. Progress report, July 1, 1980-March 15, 1981, 6:25991 (DOE/ER/10603—1)

New Hampshire Fish and Game Dept., Concord (USA)
Pilot attempt to grow winter flounders commercially. Completion report 15 Feb 77-30 Jun 80, 6:26327 (PB—81-119273)

New Hampshire Univ., Durham (USA)
Alternate fuels manufactured from high temperature solar thermal systems. Technical annual progress report, April 1, 1980-March 31, 1981, 6:24852 (DOE/ET/21067—2)

New Hampshire Univ., Durham (USA). Dept. of Chemical Engineering
Continuous two-stage solar-gasification system, 6:24841 (CONF-801104—16)
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)

New Mexico State Univ., Las Cruces (USA). Dept. of Chemical Engineering
Energy conservation in the petroleum and chemistry industry: ammonia process. Final report, August 19, 1976-May 15, 1978, 6:25198 (NP—1903403)

New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering
Applications of Fourier transform infrared spectroscopy to in situ catalyst surface studies, 6:25982 (SAND—80-2594C)

New Mexico Univ., Albuquerque (USA). Dept. of Chemical Engineering
Catalytic activity of shock-loaded TiO_2 powder, 6:25984 (SAND—81-1352C)

New York Univ., NY (USA). Dept. of Physics
Theoretical studies relating to the interaction of radiation with matter: atomic collision processes occurring in the presence of radiation fields. Annual report No. 3, 1 Aug 79-31 Jul 80, 6:26446 (AD-A—090528)

Norske Veritas, Oslo (Norway). Industrial and Offshore Div.
OTEC Pilot Plant: requirements to design fabrication inspection, maintenance and repair of Hull, CWP and SKSS, 6:25253 (DOE/NOAA/OTEC—38)

North Atlantic Treaty Organization, Brussels (Belgium). Committee on the Challenges of Modern Society
Flue gas desulfurization pilot study: summary of phase I and phase II reports, 6:25470 (PB—81-119422)

North Carolina State Univ., Raleigh (USA). Dept. of Physics
Theoretical nuclear structure studies using kaons and alpha particles. Progress report, June 1, 1980-May 31, 1981, 6:26602 (DOE/ER/10407—2)

North Dakota Univ., Grand Forks (USA)
Conversion of solvent refined lignite into premium liquid fuels. Quarterly report, January-March 1981, 6:24853 (DOE/FC/10121—T1)
Northwestern Univ., Evanston, IL (USA)
Computer simulation of kinetic properties of plasmas. Progress report, July 1, 1980-May 31, 1981, 6:26632 (DOE/ET/53041—13)
Nuclear Regulatory Commission, Washington, DC (USA)
Investigations of reported plant and animal health effects in the Three Mile Island area. Regulatory report, 6:25533 (NUREG—0738)
NUS Corp., Rockville, MD (USA)
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 10. Environmental studies. Final report, 6:25576 (EPRI-EM—1589(Vol.10))

O

Oak Ridge Associated Universities, Inc., TN (USA)
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
Oak Ridge Gaseous Diffusion Plant, TN (USA)
Hexapartite safeguards project team 3: material accounting and control questionnaire, 6:25172 (K/OA—5001)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Oak Ridge National Lab., TN (USA)
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)
Ammonia condensation experiments at Oak Ridge National Laboratory, 6:25313 (CONF-810622—1)
Analysis of the ORNL radiation-streaming integral experiments, 6:26629 (CONF-810606—40)
Analytical model of the round buoyant jet, 6:26142 (CONF-810621—5)
Annual cycle energy system, 6:25711 (CONF-810672—16)
Aryl hydrocarbon mono-oxygenase activity in human lymphocytes, 6:26389 (ORNL/TM—7721)
Calculation of neutron and gamma-ray production cross sections for calcium from 8 to 20 MeV, 6:26581 (ORNL/TM—7752)
Decay of /sup 199m,g/Po: isomeric transitions in ^{199}Po and ^{199}Bi, 6:26592 (CONF-810649—6)
Demonstration of a heat-pump water heater, 6:25710 (CONF-810672—10)
Depletion analysis and sensitivity study of PHENIX fuel-irradiation experiments, 6:25489 (CONF-810606—56)
Design guides for cell atmosphere controls, utilities and fire protection, 6:26317 (DP-MS—81-1)
Determination of ultratrace concentrations of uranium and thorium in natural waters by x-ray fluorescence, 6:25964 (CONF-810647—6)
Determination of uranium and thorium in semiconductor memory materials by high fluence neutron activation analysis, 6:25965 (CONF-810682—3)
Development and application of terrestrial food chain models to assess health risks to man and releases of pollutants to the environment, 6:26192 (IAEA-SM—254/63)
Differential sensitivity theory applied to movement of maxima responses, 6:25520 (CONF-810606—42)
Direct-contact heat exchangers for OTEC: some advantages and disadvantages, 6:25315 (CONF-810622—5)
Disposal of nuclear wastes by transmutation, 6:25119 (CONF-810606—48)
Dynamic simulation of the coal froth flotation and filtration processes, 6:24947 (CONF-810607—10)
Ecological investigations at power plant cooling lakes, reservoirs, and ponds: an annotated bibliography. Final report, 6:26324 (EPRI-EA—1874)
Effects of sublethal entrainment stresses on the vulnerability of juvenile bluegill sunfish to predation, 6:25462 (ORNL/TM—7801)
Energy analysis of the coal fuel cycle: community health and resource change in an Appalachian coal county, 6:24971 (CONF-810652—5)
Experimental and calculational results of an irradiation experiment in EBR-II, 6:25507 (CONF-810606—55)
Final analysis of the GCFR exit shield integral experiment, 6:25496 (ORNL/TM—7839)
FLUNG: coupled 35-group neutron and 21-group gamma ray, P_3 cross sections for fusion applications, 6:26702 (ORNL/TM—7828)
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)
Initial trade and design studies for the fusion engineering device, 6:26700 (ORNL/TM—7777)
Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)
Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980, 6:25033 (DOE/BETC/OR—19)
Irradiation testing of miniature fuel plates for the RERTR program, 6:25515 (ORNL/TM—7761)
Literature review: response of fish to thermal discharges. Final report, 6:26323 (EPRI-EA—1840)
Measurement of peak temperature along an optical fiber, 6:26087 (DOE/TIC—1023186)
Modeling and low-level waste management: an interagency workshop, 6:25105 (CONF-801217—)
Net energy of seven small-scale hydroelectric power plants, 6:25214 (ORNL/TM—7694)
Neutron and gamma-ray streaming calculations for the ETF neutral-beam injectors, 6:26630 (CONF-810606—46)
Neutron-photon multigroup cross sections for neutron energies $\leqq$ 400 MeV, 6:26610 (ORNL/TM—7818)
Nonlinear analysis of disruptions in the JIPP T-II tokamak, 6:26637 (ORNL/TM—7733)
OTEC gas-desorption studies, 6:25314 (CONF-810622—2)
Physicochemical characterizations of limestone for fluidized-bed coal combustion, 6:24964 (ORNL/TM—7292)
Preliminary environmenal assessment of the University of Minnesota, Duluth Coal Gasifier, FY 1980, 6:26149 (ORNL/TM—7728)
Progress in understanding the mechanical behavior of pressure-vessel materials at elevated temperatures, 6:25899 (CONF-810625—18)
Quantitative analysis of forest island pattern in selected Ohio landscapes, 6:26176 (ORNL/TM—7759)
Reference dosimetry for various Health Physics Research Reactor spectra, 6:26612 (ORNL/TM—7748)
Removal of fluoride from aqueous nitric acid, 6:25100 (ORNL/TM—7502)
Repository support of synfuels health effects research, 6:26388 (CONF-810562—1)
Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions, 6:26597 (CONF-810606—53)
Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions, 6:26598 (CONF-810606—68)
Resonance ionization spectroscopy: counting noble-gas atoms, 6:26451 (CONF-8106100—1)
Simple optoacoustic energy meter for pulsed lasers, 6:26032 (CONF-810630—6)
Sorption of iodine on low-chromium-alloy steel, 6:25484 (CONF-810606—52)
Status of the tokamak program, 6:26701 (ORNL/TM—7778)
Strontium-90 determinations by Cerenkov radiation counting for well monitoring at Oak Ridge National Laboratory, 6:25970 (ORNL/TM—7760)
Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980, 6:25720 (NBSIR—80-2145(DOE))
Transient modeling of froth flotation and vacuum filtration processes, 6:24946 (CONF-810607—8)
Two-dimensional computational modeling of sodium boiling in simulated LMFBR fuel-pin bundles, 6:25521 (CONF-810606—54)
Using GIFTS on the Cray-1 for the large coil test facility test: stand design analysis, 6:26022 (ORNL/TM—7665)
Water-related constraints to the development of geothermal electric generating stations, 6:25396 (ORNL/TM—7718)

WHC: a multi-dimensional model of water movement, heat flow, and chemical transport in complex aquifer systems, 6:26287 (ORNL/TM—7564)

Oak Ridge Y-12 Plant, TN (USA)
Bus annunciator system, 6:25757 (Y—2244)
Composite flywheel balance experience, 6:25883 (Y/DX—290)
Effect of titanium content and aging temperature on the properties of uranium-titanium alloys, 6:25916 (Y/DV—73)
Hydrogen content and strain rate effects on the tensile properties of a uranium-titanium alloy, 6:25917 (Y/DV—74)

Occidental Research Corp., Irvine, CA (USA)
Controlled flash pyrolysis, 6:24859 (DOE/PC/30264—06)

Office of Technology Assessment (U.S. Congress), Washington, DC
Environmental contaminants in food. Volume II-Part B: Working papers, 6:26199 (PB—81-116774)

Office of the Federal Inspector for the Alaska Natural Gas Transportation System, Washington, DC (USA)
Quarterly report no. 5 to the President and Congress on the construction of the Alaska Natural Gas Transportation System, 6:25076 (PB—81-115123)

Ohio Coal Research Lab. Associates, Columbus (USA)
Investigations of the changes of coal structure occurring during gasification. Progress report, 6:24904 (DOE/PC/30210—T1)

Ohio Univ., Athens (USA). Dept. of Chemistry
Investigations of the changes of coal structure occurring during gasification. Progress report, 6:24904 (DOE/PC/30210—T1)

Oregon State Univ., Corvallis (USA). Dept. of Mechanical Engineering
Fixed-wake analysis of the Darrieus rotor, 6:25426 (SAND—81-7026)
Vortex model of the Darrieus turbine: an analytical and experimental study. Final report, 6:25425 (SAND—81-7017)

P

Pacific Sun, Inc., Palo Alto, CA (USA)
Oakmead solar buildings, 6:25333 (DOE/CS/31521—T1)

Parsons (Ralph M.) Co., Pasadena, CA (USA)
Overview of the STARFIRE reference commercial tokamak fusion power reactor design, 6:26679 (CONF-801011—94)
STARFIRE: a conceptual design of a commercial tokamak power plant. Paper IAEA-CN-39/E-1, 6:26667 (CONF-800707—26)

Paulling (J. Randolph), Inc., Orinda, CA (USA)
Theory and user manual for OTEC C. W. pipe programs ROTECF and SEGPIP, 6:25317 (DOE/NOAA/OTEC—35)

PEDCo-Environmental, Inc., Cincinnati, OH (USA)
Capital and operating costs for industrial boilers. Final report Apr-Jun 79, 6:26061 (PB—81-105934)

PEDCo Environmental, Inc., Dallas, TX (USA)
Cost benefits associated with the use of physically cleaned coal. Final report May 78-Nov 79, 6:24952 (PB—81-113953)

Pennsylvania State Univ., University Park (USA)
Effect of strain rate and stress corrosion on the long-term strength of crystalline rocks. Progress report, September 1, 1980-March 15, 1981, 6:26426 (DOE/ER/10762—1)

Pennsylvania State Univ., University Park (USA). Dept. of Chemistry
Development of instrumental methods of analysis of sulfur compounds in coal-process streams: computer program manual for estimating concentrations of inorganic sulfur moieties from a thermodynamic data base. Quarterly technical progress report, January-March 1981, 6:24903 (DOE/ET/10482—T1)
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines. Progress report, August 16, 1980-April 30, 1981, 6:25996 (DOE/ER/03416—21)

Pennsylvania State Univ., University Park (USA). Materials Research Lab.
Controlled cadmium telluride thin films for solar-cell applications. Third quarterly report, December 1, 1980-February 1, 1981, 6:25260 (SERI/PR—9131-1-T3)

Philadelphia Zoological Society, PA (USA)
Cannon shredding of municipal solid waste for the preparation of biological feedstock. Final report, 6:25837 (DOE/CE/20088—01)

Pittsburgh Univ., PA (USA). Research Inst. for Energy Policy
Project Monitor: Part II. Conservation in small business: an exploratory study. Final report, 6:25718 (DOE/CS/10220—T1)

Policy and Management Associates, Inc., Boston, MA (USA)
The effect of economic regulation on fuel-use efficiency in private trucking operations. Final report, 6:25755 (PB—81-114753)

Potomac Electric Power Co., Washington, DC (USA)
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix C. Heavy hoist. Final report, 6:25210 (EPRI-EM—1589(Vol.8)(App.C))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 13. CAUPH preliminary licensing documentation. Final report, 6:25213 (EPRI-EM—1589(Vol.13))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 6. Site investigation: shallow drilling. Final report, 6:25568 (EPRI-EM—1589(Vol.6))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix E. Electrical systems. Final report, 6:25571 (EPRI-EM—1589(Vol.9)(App.E))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix A. Upper reservoir. Final report, 6:25574 (EPRI-EM—1589(Vol.8)(App.A))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 7. Site investigation: deep drilling. Final report, 6:25569 (EPRI-EM—1589(Vol.7))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix B. Champagne effect. Final report, 6:25570 (EPRI-EM—1589(Vol.9)(App.B))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix E. Lower reservoir. Final report, 6:25575 (EPRI-EM—1589(Vol.8)(App.E))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 10. Environmental studies. Final report, 6:25576 (EPRI-EM—1589(Vol.10))

Power (J.D.) and Associates, Inc., Los Angeles, CA (USA)
Impact of fuel-economy information on new-car and light-truck buyers, 6:25754 (DOE/CS/58840—T1)

Princeton Univ., NJ (USA). Elementary Particles Lab.
Charmed-meson production in 200-GeV/c pion-beryllium interactions, 6:26482 (DOE/ER/03072—120)

Princeton Univ., NJ (USA). Plasma Physics Lab.
Annual report, October 1, 1979-September 30, 1980, 6:26643 (PPPL-Q—38)
Balmer alpha emission and hydrogen atom energy in ion-source discharges, 6:26703 (PPPL—1797)
Confinement of high energy trapped particles in tokamaks, 6:26641 (PPPL—1789)
Hamiltonian field description of the one-dimensional Poisson-Vlasov equations, 6:26640 (PPPL—1788)
Ideal MHD beta-limits of poloidally asymmetric equilibria, 6:26639 (PPPL—1787)
Microchannel plate response to high-energy neutrons, 6:26638 (PPPL—1773)
Possible non-hydrogen neutralizers for high energy D^+ and H^+ beams, 6:26704 (PPPL—1803)
Resistive demountable toroidal-field coils for tokamak reactors, 6:26705 (PPPL—1809)
Transport and isomorphic equilibria, 6:26642 (PPPL—1804)

Purdue Univ., Lafayette, IN (USA). School of Nuclear Engineering
Fast Breeder Blanket Facility (FBBF). Annual report, January 1, 1980-December 31, 1980, 6:25497 (PNE—81-149)

Q

QEB, Inc., Lakewood, CO (USA)
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle, Round Up quadrangle, Hardin quadrangle

(Montana), Sheridan quadrangle, (Wyoming). Final report, 6:25092 (GJBX—179-81-Vol.1)
Airborne gamma-ray spectrometer and magnetometer survey: Sheridan quadrangle (Wyoming). Final report, 6:25095 (GJBX—179-81-Vol.2C)
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle (Montana). Final report, 6:25093 (GJBX—179-81-Vol.2A)
Airborne gamma-ray spectrometer and magnetometer survey: Hardin quadrangle (Montana). Final report, 6:25094 (GJBX—179-81-Vol.2B)
Airborne gamma-ray spectrometer and magnetometer survey: Roundup quadrangle (Montana). Final report, 6:25096 (GJBX—179-81-Vol.2D)
Airborne gamma-ray spectrometer and magnetometer survey: Jordan quadrangle, Miles City quadrangle, Glendive quadrangle (Montana), Watford City quadrangle, (North Dakota). Final report, 6:25097 (GJBX—180-81-Vol.1)

R

Radian Corp., Austin, TX (USA)
Addendum to: 'environmental assessment: source test and evaluation report--Chapman low-Btu gasification'. Final report Mar 79-Sep 80, 6:24936 (PB—81-113003)
Evaluation of 10-MW Shawnee cocurrent scrubber. Final report, 6:25453 (EPRI-CS—1806)

Radian Corp., McLean, VA (USA)
Development document for proposed effluent limitations guidelines, new source performance standards, and pretreatment standards for the steam electric point source category. Interim report, 6:25469 (PB—81-119075)

Radiation Monitoring Devices, Inc., Watertown, MA (USA)
Low cost, sprayed CdTe solar cell research. Semiannual progress report, August 15-February 14, 1981, 6:25257 (SERI/PR—8104-3-T3)

RCA Labs., Princeton, NJ (USA)
Evaluation and verification of epitaxial process sequence for silicon solar-cell production. Quarterly report No. 1, 6:25251 (DOE/JPL/955825—81/1)
Low-cost epitaxial techniques for solar-cell fabrication. Final report, 25 September 1979-24 September 1980, 6:25263 (SERI/TR—8274-1-T1)
Photovoltaic mechanisms in polycrystalline thin-film silicon solar cells. Quarterly report No. 6, November 1, 1980-January 31, 1981, 6:25249 (DOE/ET/23108—7)

Rehab Group, Inc., Falls Church, VA (USA)
Data collection and analysis. Part 1. Automated data collection process. Part 2. Data elements and reports, 6:25590 (DOE/EIA/11096—T1)

Rensselaer Polytechnic Inst., Troy, NY (USA). Dept. of Materials Engineering
The decomposition of N_2O on Ni(110). Technical report, 6:26110 (AD-A—090552)

Research Inst. of Colorado, Fort Collins (USA)
Novel concepts in electrochemical solar cells. Quarterly technical progress report, December 15, 1980-March 15, 1981, 6:25262 (SERI/PR—9272-1-T1)

Research Triangle Inst., Research Triangle Park, NC (USA)
Pollutants from synthetic fuels production: environmental evaluation of coal gasification screening tests. Final report Aug 78-Jul 79, 6:24940 (PB—81-114308)
Proceedings: symposium on flue-gas desulfurization, 6:24926 (EPA/600/9—81-019B)

Resource Planning Associates, Inc., Washington, DC (USA)
Reducing the impact of margin ceilings on gasoline wholesalers. Final report, 6:25042 (PB—81-117160)

Rice Univ., Houston, TX (USA)
Hypersonic beam laser photolysis. Technical progress report, July 15, 1980-March 15, 1981, 6:25997 (DOE/ER/06035—3)

Rochester Univ., NY (USA)
Assessment of health impacts from electrical-power transmission lines, 6:26401 (UR—3490-2024)

Rochester Univ., NY (USA). Dept. of Radiation Biology and Biophysics
Aerosol factors affecting respiratory deposition, 6:26392 (UR—3490-2026)

Rockwell International Corp., Canoga Park, CA (USA). Rocketdyne Div.
Deformable mirror study. Final report, 21 July 1980-15 May 1981, 6:26689 (DOE/DP/40052—T1)
Thermal-storage-subsystem analysis report (RADL Item 5-1), 6:25298 (DOE/SF/10499—T29)

Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant
Risk comparison of centralizing or decentralizing processing facilities for defense transuranic waste, 6:25169 (RFP—3159)

Rockwell International Corp., Palo Alto, CA (USA). Energy Systems Group
Decontamination of LMFBR components: report of FY 1979 results, 6:25493 (DOE/SF/76026—T7)

Rockwell International Corp., Richland, WA (USA). Energy Systems Group
Long-term creep of Hanford concrete at 250°F and 350°F. Final report, 6:25138 (RHO-C—50)

Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations
Analytical models for simultaneous heat and moisture transport in soils, 6:25140 (RHO-LD—49)
Electrical and electronic subsystems of a nuclear waste tank annulus inspection system, 6:25141 (RHO-SA—221)
Engineered barrier development for a nuclear waste repository in basalt, 6:25137 (RHO-BWI-SA—64)
Parametric and sensitivity analysis of waste isolation in a basalt medium, 6:25135 (RHO-BWI-C—94)
Relationships between internal structures and petrographic textures of basalt flows: example from a continental flood tholeiite province, 6:26429 (RHO-BWI-SA—67)
Review of water-well data from the unconfined aquifer in the eastern and southern parts of the Pasco Basin, 6:26417 (RHO-BWI-C—56)
Site characterization plan basalt waste isolation project, 6:25136 (RHO-BWI-CD—51(Rev.2))
Tank-farm-waste-volume projections, 6:25139 (RHO-CD—80-615)

Rockwell International Corp., Thousand Oaks, CA (USA). Science Center
Remaining fatigue lifetime prediction for retirement-for-cause in aluminum alloys, 6:25906 (IS-M—315)

Rosenblatt (M.) and Son, Inc., New York (USA)
Development of a standardized US flag dry-bulk carrier (phase II). steam coal trade projections. Final report, 6:24950 (PB—81-109688)

S

San Bernardino Municipal Water Dept., CA (USA)
Feasibility of geothermal heat use in the San Bernardino Municipal Wastewater Treatment Plant. Final report, September 1980-June 1981, 6:25408 (DOE/SF/11442—T1)

Sandia Labs., Albuquerque, NM (USA)
Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending February 28, 1979, 6:25144 (WIPP-DOE—04)
Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending March 31, 1979, 6:25145 (WIPP-DOE—05)
Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending April 30, 1979, 6:25146 (WIPP-DOE—06)

Sandia Labs., Livermore, CA (USA)
Progress report No. 29 for a program of thermoelectric generator testing and RTG degradation mechanisms evaluation, 6:25657 (DOE/ET/33003—T2)

Sandia National Labs., Albuquerque, NM (USA)
Aging characteristics of the SA1773 ceramic capacitor, 6:26051 (SAND—80-1132)
Analysis of thermal conductivity probes for high temperature applications, 6:25537 (SAND—81-0106)
Application of reparameterized Fourier descriptors of e-beam target boundaries, 6:26712 (SAND—81-1524C)

Applications of Fourier transform infrared spectroscopy to in situ catalyst surface studies, 6:25982 (SAND—80-2594C)
Catalytic activity of shock-loaded TiO_2 powder, 6:25984 (SAND—81-1352C)
Characterization of an accelerator designed to study electron-beam uniformity in large diodes, 6:26072 (SAND—81-0844C)
Chemical makeup of Nb and Nb_3Sn films, 6:25983 (SAND—81-0969C)
Code translation program for Hewlett-Packard computers, 6:26726 (SAND—81-0627)
Criterion for thermo-plastic shear instability, 6:25914 (SAND—81-0041C)
Crystallographic properties of lithium niobate shock-loaded from 3.7 to 20 GPa and preserved for post-shock study, 6:25952 (SAND—81-1315C)
Design and use of density gauges for fossil-energy processes, 6:24873 (SAND—81-1347C)
Development of solar energy in Peru, 6:25219 (SAND—81-0764)
Direct bandgap, ionizing radiation insensitive photodiode structures, 6:26089 (SAND—81-0650C)
Effect of strain-rate and microstructure on the ductile brittle transition temperature in structural steels: Part I. Literature assessment, 6:25910 (SAND—80-0732)
Elastic-plastic mechanical constitutive description for rock salt triaxial compression, 6:25142 (SAND—80-1935)
Electrical-to-chemical connection, 6:25992 (SAND—81-1350C)
Evaluation of equipment and methods to map lost circulation zones in geothermal wells, 6:25403 (SAND—80-7057)
Exploratory study of reactivity in organic compounds subjected to shock loading, 6:25993 (SAND—81-1386C)
Fixed-wake analysis of the Darrieus rotor, 6:25426 (SAND—81-7026)
Fragment-size prediction in dynamic fragmentation, 6:25911 (SAND—80-2800C)
GEND planning report, 6:25525 (GEND—001)
Guidance for implementing an Environmental, Safety and Health Assurance Program. Volume 9. Model guidelines for environmental safety and health analysis activities, 6:26403 (SAND—81-0640)
Guide to the design of physical protection systems for light water reactors, 6:25173 (SAND—81-0586C)
Improved data-reduction methods for laser-pulse-diffusivity determination with the use of minicomputers, 6:26724 (SAND—80-2602C)
Isolated data-acquisition system, 6:26723 (SAND—80-1952)
Light water reactor safety research program. Quarterly report Jan-Mar 80, 6:25535 (NUREG/CR—1509)
LINSOL: a model for predicting the optical performance of parabolic trough solar thermal systems, 6:25382 (SAND—80-2867C)
MARC calculations for the second WIPP structural benchmark problem, 6:25143 (SAND—81-0925)
Method for fast pulsed thermal diffusivity measurements in thin films, 6:26614 (SAND—80-2694C)
Nonconsumable arc melting furnace, 6:26024 (SAND—81-0810)
Numerical modeling of oblique hypervelocity impact using two-dimensional plane strain models, 6:26023 (SAND—80-2865C)
Operation of the new Hermes II Marx, 6:26710 (SAND—81-0750C)
Packaging configurations and handling requirements for nuclear materials, 6:26018 (CONF-810583—1)
Paramagnetic defects in shock-loaded TiO_2, 6:25937 (SAND—80-0019C)
Particle beam fusion progress report, January-June 1980, 6:26706 (SAND—80-2500)
PBFA I performance monitoring and evaluation system (PMES), 6:26711 (SAND—81-0751C)
Plasma channels for intense ion beam transport: theory, 6:26707 (SAND—81-0477C)
Program standard for assuring that today's management obligations in environmental, safety, and health areas are met, 6:25607 (SAND—81-1359C)
Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1, 6:25404 (SAND—80-7154/1)
Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description, 6:25405 (SAND—80-7154/2)
Qualification testing evaluation program light-water reactor safety research. Quarterly report Jul-Sep 79, 6:25534 (NUREG/CR—1492)
Reshock and release behavior of beryllium, 6:25913 (SAND—80-2864C)
Results of full-scale turbine missile concrete impact experiments, 6:25538 (SAND—81-0353C)
Sandia Computing Network NOS link conceptual design, 6:26727 (SAND—81-0859)
Sandia 25-meter compressed helium/air gun, 6:26046 (SAND—81-1477C)
Sandia shock thermodynamics applied research facility, 6:26047 (SAND—81-1528C)
Sandia technology, Volume 5, No. 4, 6:26620 (SAND—81-1065)
Shock compression temperature rise determined from resistivity of embedded metal foils, 6:25940 (SAND—80-2836C)
Shock-induced defects in cadmium sulfide, 6:25953 (SAND—81-1354C)
Shock-induced inorganic chemistry, 6:25985 (SAND—81-1455C)
Simultaneous determination of antimony and chlorine in synthetic rubbers by 14-MeV neutron-activation analysis, 6:25971 (SAND—81-0156C)
Solar photovoltaic system engineering perspectives, 6:25256 (SAND—81-1164C)
Strain-rate effects in beryllium under shock compression, 6:25912 (SAND—80-2847C)
Summary of DEEP STEAM downhole steam generator development activities, 6:25035 (SAND—81-0882C)
Testing batteries for photovoltaic power systems, 6:25589 (SAND—81-0226C)
Theory of AMPFION class ion diodes, 6:26708 (SAND—81-0599C)
Thermal conductivity of polyhalite and anhydrite from the site of the proposed waste isolation pilot plant, 6:26430 (SAND—81-0856)
Thermal-viscous model for heterogeneous yielding in aluminum, 6:25915 (SAND—81-0108C)
TOODY-WONDY calculations of penetration events, 6:26062 (SAND—81-0050C)
Transient temperature response of strain gages, 6:26088 (SAND—80-2689C)
UV-laser-triggered switches, 6:26709 (SAND—81-0695C)
Vortex model of the Darrieus turbine: an analytical and experimental study. Final report, 6:25425 (SAND—81-7017)

Sandia National Labs., Livermore, CA (USA)
Central receiver steam systems for industrial process heat applications, 6:25347 (SAND—81-8223)
Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)
Plotting program for milestone schedules and status reports user's manual, 6:26725 (SAND—80-8053)
Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant, 6:25308 (SAND—80-8190)
Thermal energy storage for solar thermal applications program. Progress report, April 1980-March 1981, 6:25580 (SAND—81-8225)

Savannah River Ecology Lab., Aiken, SC (USA)
Freshwater bivalve mollusca (unionidae, sphaeriidae, corbiculidae) of the Savannah River Plant, South Carolina, 6:26211 (SRO-NERP—3)
Response of a forest ecotone to ionizing radiation. Progress report, October 15, 1980-October 14, 1981, 6:26315 (DOE/EV/02283—2)

Schumacher (J.C.) Co., Oceanside, CA (USA)
Low-cost-silicon-process development. Phase IV: process improvement. Second quarterly technical progress report, 6:25259 (SERI/PR—8279-1-T2)

Science Applications, Inc., Golden, CO (USA)
Comparison of conventional and solar-water-heating products and industries report, 6:25328 (DOE/CS/30217—T1)

Science Applications, Inc., La Jolla, CA (USA)
Background document for the advanced notice of proposed rulemaking for dishwashers, television sets, clothes washers, humidifiers and dehumidifiers. Topical report subtask 1.1: consumers products minimum energy efficiency standards program, 6:25726 (SAI—026-79-855-LJ)
Minimum energy efficiency standards for ranges and ovens. Topical report, subtask 2.1, 6:25727 (SAI—026-79-858-LJ)
Programmer's manual for the DOEHPE (DOE Heat Pump Efficiency) program, 6:25807 (SAI—444-80-533-LJ)

Scientific Simulation, Inc., Albuquerque, NM (USA)
Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1, 6:25404 (SAND 80-7154/1)

Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description, 6:25405 (SAND—80-7154/2)

Shannon and Wilson, Inc., Seattle, WA (USA)
Geotechnical data from accelerograph stations investigated during the period 1975-1979. Summary report, 6:26419 (NUREG/CR—1643)

Sheffield Univ. (UK). Dept. of Fuel Technology and Chemical Engineering
A three-dimensional model of spray evaporation in gas turbine combustors. Interim report, 6:25854 (AD-A—090337)

SIAM Inst. for Mathematics and Society, Philadelphia, PA (USA)
Brownian-motion model of pollutant-concentration distributions. Study on statistics and environmental factors in health (SIMS), 6:26145 (DOE/EV/10428—11)
Theory for coloring bivariate statistical maps, 6:26733 (DOE/EV/10428—9)

SNSF-prosjektet, As-NLH (Nowray)
Ecological impact of acid precipitation, 6:26332 (CONF-800365—)

Solar America, Inc., Albuquerque, NM
Identification of business opportunities for the minority-owned small businesses in the solar energy area. Final report, July 1980-January 1981, 6:25218 (DOE/MI/01002—T5)
Minority Network Directory: appendix B, 6:26302 (DOE/MI/01002—T5(App.B))
Minority-owned small business directory: appendix C, 6:25223 (DOE/MI/01002—T5(App.C))
Solar Program Directory: appendix A, 6:25222 (DOE/MI/01002—T5(App.A))

Solar Energy Research Inst., Golden, CO (USA)
Advanced and innovative wind energy concept development: dynamic inducer system. Executive summary, 6:25427 (SERI/TR—8085-1-T1)
Advanced and innovative wind energy energy concept development: dynamic inducer system. Research report, 6:25428 (SERI/TR—8085-1-T2)
Application of solar thermal energy to buildings and industry, 6:25349 (SERI/TP—641-1222)
Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)
Fabrication, testing, and modeling plans for a 125-kW counter-rotating-turbine wave energy converter, 6:25410 (SERI/TP—634-1215)
Gasification engineering. Quarterly report, January-March 1981, 6:25185 (SERI/PR—622-1153)
Industrial applications analysis: market characterization and system definition for several industries, 6:25348 (SERI/TP—353-467)
Information and the solar consumer, 6:25220 (SERI/TP—753-1205)
Investigation of photoelectrochemical corrosion of semiconductors. Final report, 15 April 1980-15 April 1981, 6:25954 (SERI/TR—8002-6-T1)
Low-cost epitaxial techniques for solar-cell fabrication. Final report, 25 September 1979-24 September 1980, 6:25263 (SERI/TR—8274-1-T1)
Measured performance of falling-jet flash evaporators, 6:25320 (SERI/TP—631-1270)
Novel concepts in electrochemical solar cells. Quarterly technical progress report, December 15, 1980-March 15, 1981, 6:25262 (SERI/PR—9272-1-T1)
Preparation and characterization of hydrogenated amorphous silicon. Quarterly progress report No. 7, 1 December-28 February 1981, 6:25258 (SERI/PR—8142-4-T2)
Solar energy legal bibliography: second update, 6:25231 (SERI/TR—744-876)
Wind energy systems quarterly review, January 1-March 31, 1981, 6:25411 (SERI/PR—635-1239)

Southern Illinois Univ., Carbondale (USA)
Longterm solar heat storage in an underground water cistern retrofitted with thermal insulation. Final technical report, May 15, 1979-March 31, 1981, 6:25380 (DOE/R5/10106—3)

Southern Research Inst., Birmingham, AL (USA)
A manual for the use of electrostatic precipitators to collect fly ash particles. Final report Dec 78-Feb 80, 6:25467 (PB—81-112757)

Southwest Research Inst., San Antonio, TX (USA)
Optimization of accelerated stability-test techniques for diesel fuels. Final report, 6:25052 (DOE/BC/10043—25)

Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.
Engine tests using high-sulfur diesel fuel. Final report, 6:25851 (AD-A—090142)
Investigation of fire-vulnerability-reduction effectiveness of fire-resistant diesel fuel in armored vehicular fuel tanks. Final report 25 Sep 79-30 Sep 80, 6:25051 (AD-A—090129)

SRI International, Menlo Park, CA (USA)
Collisional processes of interest in MFE plasma research. Progress report No. 4, April 1, 1981-May 31, 1981, 6:26631 (DOE/ET/53025—T8)
Investigation of photoelectrochemical corrosion of semiconductors. Final report, 15 April 1980-15 April 1981, 6:25954 (SERI/TR—8002-6-T1)

Stanford Linear Accelerator Center, CA (USA)
FASTBUS introduction and demonstration, 6:26090 (SLAC-PUB—2738)
Support and utilization of the LSI-11 processor family at SLAC, 6:26728 (SLAC-PUB—2727)
Two Word CAMAC I/O module, 6:26082 (SLAC-TN—81-2)

Stanford Univ., CA (USA)
Solar space- and water-heating system at Stanford University. Final report, 6:25334 (DOE/CS/31522—T2)

Stanford Univ., CA (USA). Dept. of Physics
Fundamental experiment at liquid helium temperature. Final report 1 Oct 74-31 Sep 79, 6:26012 (AD-A—090549)

Stanford Univ., CA (USA). Dept. of Statistics
Brownian-motion model of pollutant-concentration distributions. Study on statistics and environmental factors in health (SIMS), 6:26145 (DOE/EV/10428—11)
Modeling and analysis of air-quality data. Technical report No. 43, 6:26144 (DOE/EV/10428—8)
Theory for coloring bivariate statistical maps, 6:26733 (DOE/EV/10428—9)

Stanford Univ., CA (USA). Petroleum Research Inst.
Numerical modeling of thermal recovery processes SUPRI-TR-12, 6:25034 (DOE/ET/12056—12)

State Univ. of New York, Buffalo (USA). Dept. of Mechanical Engineering
Modeling of heated surface jets. Final technical report, 6:26295 (PB—81-116857)

State Univ. of New York Downstate Medical Center, Brooklyn (USA). Dept. of Radiation Oncology
Biological effects of ionizing radiation at the molecular, cellular, and organismal levels. Progress report, October 15, 1978-October 14, 1981, 6:26316 (DOE/EV/10503—1)

State Univ. of New York, Stony Brook (USA)
$^{12}C/^{13}C$ and H/D vapor pressure isotope effects of fluoroform: intermolecular interactions in liquid fluoroform, 6:26452 (DOE/ER/10612—3)
Potential role of district heating in the US, 6:25834 (BNL—29282)

Stearns-Roger Engineering Co., Denver, CO (USA)
Plant-control-room design specification (RADL item 7-26): 10-MWe solar-thermal central-receiver pilot plant: solar-facilities design integration, 6:25302 (DOE/SF/10499—T34)

Stearns-Roger, Inc., Denver, CO (USA)
10-MWe Solar-thermal central-receiver pilot plant: solar-facilities design integration. Beam-characterization subsystem targets procurement documentation (RADL item 7-43), 6:25300 (DOE/SF/10499—T31)

Stelle Group, IL (USA)
US Department of Energy midwest appropriate technology small grants program. Semi-annual technical progress report, 6:25193 (DOE/R5/10217—1)

Stoller (S.M.) Corp., New York (USA)
Study of factors governing US utility nuclear power decisions, 6:25482 (DOE/ET/34009—T1)

Sturm (J.E.), Inc., Clarksburg, WV (USA)
Solar heating and hot water system installed at Alderson Broaddus College, Philippi, West Virginia, 6:25341 (DOE/NASA/CR—161756)

Swedish Council for Building Research, Stockholm
Swedish heat pump projects 1979: research, development, full-scale experiments, 6:25725 (PB—81-114530)

Systems and Applied Sciences Corp., Riverdale, MD (USA)
Quarterly project status report, April-June 1981, 6:25640 (DOE/RG/10367—T3)

T

Technecon Analytic Research, Inc., Philadelphia, PA (USA)
Geothermal well-field and power-plant investment-decision analysis, 6:25393 (DOE/ET/27242—T1)
Tech. Reps., Inc., Albuquerque, NM (USA)
Guidance for implementing an Environmental, Safety and Health Assurance Program. Volume 9. Model guidelines for environmental safety and health analysis activities, 6:26403 (SAND—81-0640)
Tennessee State Planning Office, Nashville (USA)
An evaluation of air pollution abatement relaxation strategies for Tennessee during periods of pending or actual energy emergencies. (Tennessee State science, engineering, and technology project). Final report, 6:25605 (PB—81-114605)
Tennessee Univ., Knoxville (USA)
Decay of /sup 199m,g/Po: isomeric transitions in ^{199}Po and ^{199}Bi, 6:26592 (CONF-810649—6)
Effects of thermal additions on the presence of pathogenic and nonpathogenic free-living amoebae at the Savannah River Laboratory, 6:26294 (DP-MS—81-64)
Tennessee Univ., Knoxville (USA). Water Resources Research Center
Thermal stress studies on selected zooplankton species and an isopod, 6:26326 (PB—81-115610)
Tennessee Univ., Tullahoma (USA). Space Inst.
Development and heat transfer analysis of direct coal-fired MHD combustors, 6:25650 (DOE/ET/10815—T4)
Tetra Tech, Inc., Columbus, OH (USA)
Evaluation of Devonian shale potential in West Virginia, 6:25068 (DOE/MC/10389—T1)
Tetra Tech, Inc., Lafayette, CA (USA)
Methodology to evaluate the potential for ground water contamination from geothermal fluid releases. Final report, 6:25395 (PB—81-111114)
Texas Christian Univ., Fort Worth (USA). Dept. of Biology
Freshwater bivalve mollusca (unionidae, sphaeriidae, corbiculidae) of the Savannah River Plant, South Carolina, 6:26211 (SRO-NERP—3)
Texas Transportation Inst., College Station (USA)
Analytical and experimental assessment of highway impact on air quality: data analysis and model evaluation. Research report (final) Sep 74-21 Jan 80, 6:26159 (PB—81-114738)
Texas Univ., Austin (USA). Center for Energy Studies
Preliminary analysis of the natural gas market-ordering problem, 6:25073 (UT/CES-PS—15)
Urban revitalization and displacement: types, causes, and public policy, 6:25728 (UT/CES-PS—16)
Texas Univ., Austin (USA). Dept. of Petroleum Engineering
Tertiary oil recovery processes research at the University of Texas. Final report, October 1979-September 1980, 6:24974 (DOE/BC/20001—10)
Thermo Electron Corp., Waltham, MA (USA)
DOE/JPL Advanced Thermionic Technology Program. Progress report No. 44, July-August-September 1980, 6:25659 (DOE/ET/11292—T4)
DOE/JPL Advanced Thermionic Technology Program. Progress report No. 45, October-November-December 1980, 6:25660 (DOE/ET/11292—T5)
Toronto Univ., Ontario (Canada)
Use of the ECL-CAMAC trigger processor system for recoil missing mass triggers at the Tagged Photon Spectrometer at Fermilab, 6:26077 (FERMILAB-Conf—81/40-EXP)
TRC Environmental Consultants, Wethersfield, CT (USA)
Exposure to pollutants from domestic combustion sources: a preliminary assessment. Final report Aug 79-Feb 80, 6:26153 (PB—81-111536)
TRW Energy Systems Planning Div., Morgantown, WV (USA)
Anchor/Darling Double-Disc Gate Valve, METC SOA Test Valve No. A-12 and Test Valve No. A-12R state-of-the-art Lockhopper Valve-Testing and Development Project. Summary test report, 6:24855 (DOE/MC—169)
TRW, Inc., Cleveland, OH (USA)
W-K-M Dyna-Seal Ball Valve METC SOA Test Valve No. A-7, state-of-the-art lockhopper valve-testing and development project. Summary test report, 6:24854 (DOE/MC—159)
TRW, Inc., McLean, VA (USA). Energy Systems Planning Div.
Energy/economic model analysis. Volume 2: evaluation of energy supply/demand integrating models. Final report, 6:25594 (PB—81-114233)
Energy/economic model analysis. Volume 1: gas technology assessments using three energy supply/demand integrating models. Final report, 6:25593 (PB—81-114225)

U

Ueland and Junker, Architects and Planners, Philadelphia, PA (USA)
Solar Atrium: a hybrid solar heating and cooling system, 6:25337 (DOE/CS/34135—T4)
Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.
Quality-assurance approach for the Elmo Bumpy Torus Proof-of-Principal experiment, 6:26688 (CONF-810654—2)
Union Carbide Corp., Tarrytown, NY (USA). Tarrytown Technical Center
COthane, methane from waste CO. Final technical report, 6:25182 (DOE/CS/40177—T2)
UNISOR, Oak Ridge, TN (USA)
Decay of /sup 199m,g/Po: isomeric transitions in ^{199}Po and ^{199}Bi, 6:26592 (CONF-810649—6)
United Technologies Corp., East Hartford, CT (USA)
Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments, 6:26437 (DOE/ER/10160—4)
United Technologies Corp., South Windsor, CT (USA)
Cost projections for redox energy-storage systems. Final report, April 30, 1979-September 30, 1979, 6:25666 (DOE/NASA/0126—1)
UOP, Inc., Des Plaines, IL (USA)
Geothermal hydrogen sulfide removal, 6:25394 (DOE/ET/27203—1)
Upland Hills Ecological Awareness Center, Oxford, MI (USA)
Upland Hills Ecological Awareness Center solar air-heating system: control, monitoring, and documentation grant. Final report, 6:25377 (DOE/R5/10123—1)
Urban Inst., Washington, DC (USA)
The impact of residential energy conservation standards on credit markets, 6:25723 (PB—81-106940)
USAEC Albuquerque Operations Office, NM
Solar central receiver heliostat mirror module development, 6:25306 (SAND—79-8189)
USAEC Nevada Operations Office, Las Vegas
Nevada Nuclear Waste Storage Investigations: Quality Assurance Plan, 6:25126 (NVO—196-17-Rev.1)
USDOE Albuquerque Operations Office, NM. Waste Isolation Pilot Plant Project Office
Public information plan for the Waste Isolation Pilot Plant Project, 6:25162 (WIPP-DOE—43)
Waste Isolation Pilot Plant. Project progress report for month ending August 31, 1980, 6:25152 (WIPP-DOE—74)
Waste Isolation Pilot Plant. Project progress report for month ending September 30, 1980, 6:25153 (WIPP-DOE—75)
Waste Isolation Pilot Plant. Project progress report, November-December 1980, 6:25155 (WIPP-DOE—83)
Waste Isolation Pilot Plant. Project progress report for month ending October 31, 1980, 6:25154 (WIPP-DOE—76)
Waste Isolation Pilot Plant. Project progress report, March 31, 1981, 6:25158 (WIPP-DOE—86)
Waste Isolation Pilot Plant. Project progress report for month ending April 30, 1981, 6:25159 (WIPP-DOE—87)
Waste Isolation Pilot Plant. Project progress report, February 28, 1981, 6:25157 (WIPP-DOE—85)
Waste Isolation Pilot Plant. Project progress report, January 31, 1981, 6:25156 (WIPP-DOE—84)
Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending February 28, 1979, 6:25144 (WIPP-DOE—04)

Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending March 31, 1979, 6:25145 (WIPP-DOE—05)
Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending April 30, 1979, 6:25146 (WIPP-DOE—06)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending May 31, 1979, 6:25147 (WIPP-DOE—24)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending August 31, 1979, 6:25150 (WIPP-DOE—36)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending September 30, 1979, 6:25151 (WIPP-DOE—37)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending June 30, 1979, 6:25148 (WIPP-DOE—25)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending July 31, 1979, 6:25149 (WIPP-DOE—35)

USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC
Comparison of load determination methodologies for building energy-analysis programs. Final report, 6:25717 (DOE/CE/20184—1)

USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC. Office of Transportation Programs
Impact of fuel-economy information on new-car and light-truck buyers, 6:25754 (DOE/CS/58840—T1)

USDOE Assistant Secretary for Conservation and Solar Energy, Washington, DC. Office of Advanced Conservation Technologies
Progress and forecast in electric-vehicle batteries, 6:25878 (CONF-800939—2)

USDOE Assistant Secretary for Environment, Washington, DC. Office of Environmental Assessments
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)

USDOE Office of National Waste Terminal Storage Integration, Columbus, OH. Battelle Project Management Div.
Geologic disposal of radioactive waste: program plan for field testing, 6:25121 (DOE/NWTS—80-1)

USDOE Office of Policy, Planning and Analysis, Washington, DC. Office of Conservation
Impact of fuel-economy information on new-car and light-truck buyers, 6:25754 (DOE/CS/58840—T1)

Utah Univ., Salt Lake City (USA). Dept. of Mining and Fuels Engineering
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)

V

Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
Development and application of analytical techniques to chemistry of donor solvent liquefaction. Quarterly progress report, April 1980-June 1980, 6:25968 (DOE/PC/30041—T2)

Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Engineering Science and Mechanics
Planetary boundary-layer wind model evaluation at a mid-Atlantic coastal site, 6:25420 (DOE/ET/23007—80/1)

W

Wapora, Inc., Washington, DC (USA)
Environmental impact assessment guidelines for new source coal gasification facilities. Interim report (final), 6:24941 (PB—81-114555)
Testing of lithium-sulfur dioxide cells for waste disposal hazards. Final report sep 79-mar 80, 6:25582 (AD-A—090785)

Water and Power Resources Service, Denver, CO (USA). Engineering and Research Center
Wind resource of the area surrounding Medicine Bow, Wyoming, 6:25422 (PB—81-109621)

Wesleyan Univ., Middletown, CT (USA)
Analysis of the chemistry associated with ozonolysis of organic pollutant molecules in water, 6:24942 (PB—81-115651)

Westinghouse Electric Corp., Concordville, PA (USA). Combustion Turbine Systems Div.
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Exhaust-fired fluid-bed combined cycle for power generation: preliminary feasibility study. Final report, 6:25442 (EPRI-CS—1818)
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)

Westinghouse Electric Corp., Madison, PA (USA). Advanced Reactors Div.
Simulation of fluid thermal fluctuations in the CRBRP steam generator using model testing, 6:25490 (CONF-810804—4)

Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.
Advanced coal-gasification system for electric-power generation. Fourth quarterly progress report, July 1-September 30, 1980, 6:24850 (DOE/ET/14752—T5)

Westinghouse Electric Corp., Muncie, IN (USA). Large Power Transformer Div.
Study to improve transmission system availability and utilization through identification of critical parameters and transformer performance analysis. Final technical report, 6:25472 (DOE/ET/29356—6)

Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.
Low-cost solar-array project production process and equipment task: a module experimental-process system-development unit (MEPSDU). Quarterly report No. 2, March 1, 1981-May 31, 1981, 6:25252 (DOE/JPL/955909—81/2)

Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.
Inertial-confinement fusion central-station electric-power-generating plant. Final report, March 1, 1979-September 30, 1980, 6:26690 (DOE/DP/40086—1(Vol.1))
Inertial-confinement fusion central-station electric-power-generating plant. Final report, March 1, 1979-September 30, 1980, 6:26691 (DOE/DP/40086—1(Vol.2))

Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
Evaluation of ceramic fiber filters for hot gas cleanup in pressurized fluidized-bed combustion power plants, 6:25444 (EPRI-CS—1846)
Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report, 6:25443 (EPRI-CS—1845)

Westinghouse Electric Corp., Pittsburgh, PA (USA). Research Labs.
Open-cycle MHD technology status and development perspective: operational analysis of open-cycle MHD, 6:25652 (EPRI-AP—1864)

Westinghouse Electric Corp., Raleigh, NC (USA)
Field demonstrations of communication systems for distribution automation. Final report, 6:25475 (EPRI-EL—1860(Vol.3))
Field demonstrations of communication systems for distribution automation. Final report, 6:25476 (EPRI-EL—1860(Vol.4))

Westinghouse Research and Development Center, Pittsburgh, PA (USA)
Chemically active fluid bed for SOX control. Volume I. process evaluation studies. Final report Jul 75-Oct 79, 6:24939 (PB—81-113946)
Silicon materials task of the low-cost solar-array project. Phase IV. Effects of impurities and processing on silicon solar cells. Twenty-second quarterly report, January 1981-March 1981, 6:25250 (DOE/JPL/954331—81/14)

Wilson (J.W.) and Associates, Inc., Washington, DC (USA)
Comparative class rates of return in the electric utility industry: a comparative study of electric rates charged to small business consumers. Final report, 6:25642 (PB—81-110322)

Wirtschaft und Infrastruktur G.m.b.H. und Co. Planungs-KG, Muenchen (Germany, F.R.)
Study on an example of heat supply from waste heat. Final report, 6:25804 (PB—81-104879)

Wyoming Univ., Laramie (USA). Water Resources Research Inst.
Tongue River in Wyoming: a baseline fisheries assessment, Monarch to the state line, 6:26297 (ANL/LRP—10)

Y

Yale Univ., New Haven, CT (USA). High Temperature Chemical Reaction Engineering Lab.
Combustion-system processes leading to corrosive deposits, 6:26010 (DOE/NASA/2593—27)

AUTHOR INDEX

Authors' surnames are indexed in the form appearing in the abstracted publication; given names are reduced to initials. Each author entry gives the publication title and the citation number. Report numbers, if applicable, are given in parentheses at the end of the entry. For publications with multiple authors, an author entry is provided for each. Entries for the second and succeeding authors give references to the first author.

Because of problems involved in the mechanical preparation of this index, all accent marks are omitted. Changes in spelling introduced as a result of accent omission follow standard conventions.

A

Abashian, A., *See* Miller, M., 6:26483

Abbin, J.P. Jr., Binary Rankine-cycle engines for solar-thermal power systems, 6:25309

Abdou, M., Limiter/vacuum system for plasma impurity control and exhaust in tokamaks, 6:26681 (CONF-801011—96)
See Jung, J., 6:26670

Abdou, M.A., Choice of coolant in commercial tokamak power plants, 6:26672 (CONF-801011—87)
STARFIRE: a conceptual design of a commercial tokamak power plant. Paper IAEA-CN-39/E-1, 6:26667 (CONF-800707—26)
See Baker, C.C., 6:26679
See Gohar, Y., 6:26682

Abolins, M.A., *See* Yager, P.M., 6:26487

Abraham, B.M., *See* Appelman, E.H., 6:25176

AbrahaM, J.P., *See* Gibbs, L.L., 6:26061

Abrahamsen, G., Acid precipitation, plant nutrients and forest growth, 6:26337 (CONF-800365—, pp 58-63)
Effects of acid precipitation on soil and forest. 1. Methods of the field experiments, 6:26350 (CONF-800365—, pp 190-191)
Effects of acid precipitation on soil and forest. 4. Leaching of plant nutrients, 6:26352 (CONF-800365—, pp 196)
Effects of simulated rain on the effluent from lysimeters with acid, shallow soil, rich in organic matter, 6:26139 (CONF-800365—, pp 152-153)

Abrams, G., *See* Schindler, R.H., 6:26486

Abrams B.I., *See* Mitchell, M.J., 6:26231

Abshire, G., Anomalous low mass e^+e^- pair production in 17 GeV/c π^- p collisions, 6:26498

Adair, R.K., *See* Schmidt, M.P., 6:26560

Adams, J., *See* Jackson, A.J., 6:25684

Adams, J.F., Cyclical warm boiler washing using furnace soot blowers in conjunction with additive usage, 6:25447 (EPRI-WS—80-127, pp 2.63-2.64)

Adams, M., *See* Abshire, G., 6:26498

Adams, P.H., Transient temperature response of strain gages, 6:26088 (SAND—80-2689C)

Adams, P.J., *See* Sommerlad, R.E., 6:26059

Adams, V.D., *See* Medine, A.J., 6:26224

Adegbulugbe, A.O., *See* Meyer, J.E., 6:26692

Agarwal, A.K., Pricetown I underground coal gasification field test: operations report, 6:24869 (MLM-MU—81-62-0007)

Ahmed, M.U., *See* Cason, N.M., 6:26493

Aho, G.D., *See* Vyas, K.C., 6:25084

Ajzenberg-Selove, F., *See* Flynn, E.R., 6:26590

Alam, M.S., *See* Schindler, R.H., 6:26486

Albright, L.D., Enhancing passive solar heating of commercial greenhouses, 6:25353

Alburger, D.E., Beta-ray branching in the decay of ^{20}F, 6:26580
See Haustein, P.E., 6:26583

Alde, D.M., *See* Lockyer, N., 6:26502

Alder, B.J., Dielectric constant of atomic fluids with variable polarizability, 6:26471

Alder, D., Metal tracers in two marine microcosms: sensitivity to scale and configuration, 6:26290

Aldred, A.T., *See* Cashion, J.D., 6:25896

Alexander, A.G., Production of nonwoody land plants as a renewable energy source, 6:25282

Alexander, M., Effects of acid precipitation on biochemical activities in soil, 6:26335 (CONF-800365—, pp 47-52)

Alfheim, I., Analysis of organic micropollutants in aerosols, 6:26118 (CONF-800365—, pp 100-101)

Allan, G.E., *See* Cook, G.R., 6:25747

Alleau, T., High-temperature phase change thermal storage, 6:25766 (CONF-800272—, pp 25-43)

Allen, A., /beta/-glucosidase production by aspergillus phoenicis in stirred-tank fermentors, 6:25288

Allen, E., *See* Bar-Cohen, A., 6:25722

Allen, J.M., 100% passive solar-heated underground structure, 6:25695 (CONF-800438—, pp 22-32)

Allen, P.C., Some heat engine cycles in which liquids can work, 6:26624

Allen, R.O., Contribution from long-range atmospheric transport to the heavy metal pollution of surface soil, 6:26119 (CONF-800365—, pp 102-103)

Allen, T.W., *See* Hurtubise, R.J., 6:24915

Allgood, G.O., *See* Brown, C.H. Jr., 6:24946
See Canright, G.S., 6:24947

Allison, D.P., *See* LaMarca, M.E., 6:26318

Allmon, B.A., *See* Wahle, H.W., 6:25761

Allred, D.D., *See* Booth, D.C., 6:25376

Allsup, J.R., *See* Gurney, M.D., 6:25885
See Naman, T.M., 6:25886, 6:25887

Almen, K.E., Some experiences from well testing in precambrian rocks of Sweden, 6:26405 (LBL—12076, pp 15-37)

Alonso, D., *See* Nixon, S.W., 6:26244

Alsmiller, R.G. Jr., Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
See Lillie, R.A., 6:26630
See Santoro, R.T., 6:26629

Alspector, J., *See* Miller, M., 6:26483

Altenhofen, C., *See* deNoyelles, F. Jr., 6:26233

Altman, R.F., Fly-ash conditioning: status and findings of EPRI program, 6:25456 (EPRI-WS—80-127, pp 3.29-3.40)

Altwicker, E.R., *See* Galloway, J.N., 6:26267
See Johannes, A.H., 6:26268

Alverson, G., *See* Koester, L.J., 6:26499

Alvin, M.A., *See* Wenglarz, R.A., 6:25443

Amaefule, J.O., Relative permeability of low tension systems at elevated temperatures, 6:25026 (DOE/BETC/IC—80/3(Vol.2), pp 14p, Paper 17)

Aman, G.M. III, Legal and practical aspects of controlling the waste flow: a case study from Delaware County, Pennsylvania, 6:25630 (ANL/CNSV-TM—60, pp 443-453)

Ambrose, K.R., *See* Knapp, F.F., 6:26311

Ambrose, M.J., *See* DeCorso, S.M., 6:25440

Amdurer, M., *See* Alder, D., 6:26290

Ammar, R., Observation of charmed F^+ meson produced by neutrino interaction in emulsion, 6:26504

Ammosov, V., *See* Ammar, R., 6:26504

Amos, J.C., Status of prototype rupture disc testing in the large leak test rig, 6:25492 (DOE/SF/70030—T18)

Amundsen, C.B., *See* Cassel, T.A.V., 6:25393

Anderson, D.N., Effects of fuel-injector design on ultra-lean combustion performance, 6:25864 (DOE/NASA/51040—26)

Anderson, D.V., *See* Barnes, D.C., 6:26661

Anderson, R.M., *See* Ford, W.T., 6:24989

Anderson, R.V., *See* Elliott, E.T., 6:26180

Anderson, S., *See* Sowell, E.F., 6:25390

Anderson, S.R., *See* Freeman, D.L., 6:25417

Anderson, W.A., *See* Rajkanan, K., 6:25269

Anderson, W.C., Role of the consulting engineer in the implementation of resource recovery systems, 6:25828 (ANL/CNSV-TM—60, pp 273-283)

Andersson, G., *See* Gahnstroem, G., 6:26279

Andre, J., Earth sheltered concrete domes using a geodesic formwork, 6:25748
Andrews, V.E., *See* Smith, D.D., 6:26195
Ang, P.G.P., Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)
Ankenbrandt, C., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Anson, D., Summary of discussion-group sessions on use of additives in coal-fired plants, 6:24963 (EPRI-WS—80-127, pp 3.44-3.51)
Summary of special discussion group on acid plumes and fallout, 6:25458 (EPRI-WS—80-127, pp 3.52-3.55)
Use of fuel additives in coal firing, 6:24960 (EPRI-WS—80-127, pp 1.33-1.41)
Anunuso, C.I., *See* Ettinger, K.V., 6:26085
Anunuso, C.J., *See* Ettinger, K.V., 6:26084
Apel, C.T., *See* Zalewski, E.F., 6:26039
Appel, J., *See* Martin, J., 6:26077
Appelman, E.H., Substantive improvement of the thermal efficiency of the mercury-iodine thermochemical cycle ANL-4, 6:25176 (CONF-800616—10)
Arakawa, E.T., *See* Chung, M.S., 6:26472
Aristarain, A., *See* Delmas, R.J., 6:26181
Armitage, B.J., Effects of temperature on periphyton biomass and community composition in the Browns Ferry experimental channels, 6:26328
Armstrong, W.T., *See* Lipson, J., 6:26646
Arnett, R.C., Parametric and sensitivity analysis of waste isolation in a basalt medium, 6:25135 (RHO-BWI-C—94)
Arnold, R., *See* Martin, R.L., 6:26668
Arnold, R.C., Three Mile Island Unit 2: decontamination program, 6:25544
See Martin, R.L., 6:26685
Arnold, R.G., *See* Rock, S., 6:26511
Arthur, J.R., Basic research needs and opportunities in thin films and coatings, 6:25246 (CONF-8006156—, pp 199-214)
Asay, J.R., Strain-rate effects in beryllium under shock compression, 6:25912 (SAND—80-2847C)
See Chhabildas, L.C., 6:25913
Asbridge, J.R., *See* Forbes, T.G., 6:26439
Ascoli, G., *See* Koester, L.J., 6:26499
Ashby, H.A., Testing support for evaluation of inspection/maintenance issues. (Test Group No. 1). Technical report, 6:25870 (PB—81-115081)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 2 and 5). Technical report, 6:25871 (PB—81-115099)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 3, 4 and 7). Technical report, 6:25872 (PB—81-115107)
Ashcraft, R.W., Computer program for storage and retrieval of thermal-stability data for explosives, 6:26098 (MHSMP—81-29)
Ashley, C.S., *See* Ward, R.L., 6:26321
Asman, W., *See* Slanina, J., 6:26134
Asman, W.A.H., Meteorological interpretation of the chemical composition of precipitation and some results of sequential rain sampling, 6:26135 (CONF-800365—, pp 140-141)
Astill, K.A., *See* Callahan, T.F., 6:25810
Atac, M., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Attig, R.C., *See* Roy, G.D., 6:25650
Auer, I.P., Measurement of the difference in pn total cross sections in pure longitudinal spin states, 6:26489
Measurement of the difference in pn total cross sections in pure longitudinal spin states, 6:26490
Auer, W.W., Solar energy systems for agricultural and industrial process drying, 6:25361
Aughenbaugh, N.B., *See* Green, B.H., 6:25740
Ausmus, B.S., Terrestrial microcosms: what questions do they address, 6:26178
Austin, J., *See* Duty, R.C., 6:24920
Averback, R.S., Comparison of fission fragment damage with fast neutron damage in metals, 6:25931
Awes, T.C., Precompound emission of light particles in the reaction $^{16}O + ^{238}U$ at 20 MeV/nucleon, 6:26599
Axe, J.D., Fluctuations and freezing in a one-dimensional liquid: Hg/sub 3-δ/ AsF_6, 6:26617
Ayer, F.A., Proceedings: symposium on flue-gas desulfurization, 6:24926 (EPA/600/9—81-019B)
Ayers, W.H., A three-dimensional model of spray evaporation in gas turbine combustors. Interim report, 6:25854 (AD-A—090337)
Azar, J.J., *See* Ikoku, C.U., 6:24996

B

Babecki, J., *See* Ammar, R., 6:26504
Baca, R.G., *See* Arnett, R.C., 6:25135
See Gibbs, A.G., 6:25140
Back, B.B., *See* Awes, T.C., 6:26599
Backhus, D., *See* Clinard, L., 6:25605
Baes, C.F., *See* Kaye, S.V., 6:26192
Baggs, D.W., Lithotecture of Australia: with specific reference to thermal factors, 6:25734
Baggs, S.A., Lithotecture of Australia: with specific reference to user health factors, 6:25735
Taxonomy of underground space, 6:26202 (CONF-800438—, pp 189-197)
Bailly, H.C., Market outlook for energy-saving technologies in the US industrial sector, 6:25780 (CONF-800272—, pp 255-275)
Baird, C.D., Solar drying of seafood products, 6:25359
Bajars, L., *See* Happel, J., 6:24871
Baker, C.C., Implications of the DD fuel cycle on tokamak reactor technology considerations, 6:26678 (CONF-801011—93)
Overview of the STARFIRE reference commercial tokamak fusion power reactor design, 6:26679 (CONF-801011—94)
Steady-state tokamak reactor with non-divertor impurity control: STARFIRE, 6:26669 (CONF-800950—20)
See Abdou, M.A., 6:26667
Baker, D.N., Near-equatorial, high-resolution measurements of electron precipitation at L≥6.6, 6:26443
Baker, G.G., *See* Knudson, C.L., 6:24878
Baker, J.G., Sources of deep-coal-mine productivity change, 1962 to 1975, 6:25635
Baker, J.P., Aluminum toxicity to fish as related to acid precipitation and Adirondack surface water quality, 6:26361 (CONF-800365—, pp 292-293)
Baker, L., *See* Freeman, J.R., 6:26707
Baktash, C., *See* Kreiner, A.J., 6:26585
Balch, J.W., Specifications for the Linear Charge Coupled Device for use in transient recording, 6:26052 (UCID—19048)
Baldo, P.M., *See* Pronko, P.P., 6:25895
Baldwin, J.D.C., Improved control strategy for wind-powered refrigerated storage of apples, 6:25432
Ballantyne, W.E., Energy recovery from municipal solid waste and sewage sludge using multisolid fluidized-bed combustion technology, 6:25205
Ballard, C.A., International conference on prepared fuels and resource recovery, 6:26300 (ANL/CNSV-TM—60, pp 37-51)
Balluffi, R.W., Basic research needs and opportunities at the solid/solid interface: diffusion, 6:25242 (CONF-8006156—, pp 135-149)
Baltisberger, R.J., Conversion of solvent refined lignite into premium liquid fuels. Quarterly report, January-March 1981, 6:24853 (DOE/FC/10121—T1)
Separation and characterization of lignite derived preasphaltenes by gel permeation chromatography and nuclear magnetic resonance spectrometry, 6:24914
Bame, S.J., *See* Forbes, T.G., 6:26439
See Sckopke, N., 6:26441
Bancel, P.A., Vortex unbinding in superconducting thin films, 6:26618 (CONF-800561—4)
Bankaitis, H., Lightning-accommodation systems for wind-turbine-generator safety, 6:25421 (DOE/NASA/20320—31)
System safety in Stirling engine development, 6:25876 (DOE/NASA/51040—25)
Banks, D., Role of well testing in civil engineering, 6:26096 (LBL—12076, pp 3-10)
Bankvall, C.G., Natural convective heat transfer in permeable insulation, 6:25750
Bar-Cohen, A., Tests for thermal efficiency of dwellings. Final report, 6:25722 (PB—81-105736)
Baranov, V., *See* Ammar, R., 6:26504
Barbera, N.J., *See* Fraser, M.D., 6:25285
Barberan, N., *See* Echenique, P.M., 6:26616
Barclay, J.A., Materials for magnetic refrigeration between 2 and 20 K, 6:25949 (LA—8746-MS)
Barclay, M.E., *See* Wells, J.C., 6:26586
Barger, V., Gluon fusion, 6:26535
Multi-W and Z Bosons, 6:26541
Neutrino oscillation phenomenlogy, 6:26503
Neutrino oscillations of the second class, 6:26544

Proceedings of topical workshop on the production of new particles in super high energy collisions, 6:26481
Role of non-spectator interactions in charm and bottom decays, 6:26539
Same-sign dilepton puzzle, 6:26527
Barish, B., Recent results from the CFRR neutrino experiment at Fermilab, 6:26517
Barish, J., *See* Alsmiller, R.G. Jr., 6:26610
Barker, L.L., Two Word CAMAC I/O module, 6:26082 (SLAC-TN—81-2)
Barker, R.J., *See* Goldstein, S.A., 6:26444
Barnes, C.E., *See* Wiczer, J.J., 6:26089
Barnes, D.C., Long-wavelength magnetohydrodynamic stability of the field reversed theta pinch, 6:26661
Barnes, J.M., *See* Lillie, R.A., 6:26630
See Santoro, R.T., 6:26629, 6:26702
Barnes, J.W., ^{82}Sr recovery from Mo irradiated for ^{77}Br production, 6:26007
Barnes, R.W., Industrial cogeneration, 6:25623
Barnett, R.M., Using e^+e^- cross-sections to test QCD and to search for new particles, 6:26549
Barney, D.L., Recent progress in lithium/iron sulfide battery development, 6:25585 (CONF-800806—46)
Barnwell, J.L., *See* Ward, C.E., 6:24985
Baron, J., *See* Herrmann, R., 6:26251
Barrett, J.R., *See* Dale, A.C., 6:25354
Barry, K., *See* Baker, C.C., 6:26679
Barth, A.E., The effects on measured emissions of a modified FTP (Federal Test Procedure) driving cycle. Technical report, 6:25884 (PB—81-103350)
Barthe, M-P., *See* Degenne, M., 6:25682
Bartholomew, C.H., Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Bartlett, G.S., *See* Dohrenwend, B.P., 6:25553
Basheer, R., *See* Gvozdic, N., 6:26004
Basile, L.J., *See* Appelman, E.H., 6:25176
Bass, A., *See* Paton, D.L., 6:25415
Baston, M. Jr., *See* Jackson, J.A., 6:25102
Batson, C.H., *See* Berkowitz, J., 6:26447, 6:26467
Battacharyya, S.N., Radiation chemical studies of nickel-glycine. Hydrogen abstraction by OH radicals and oxidation by Br_2^{-1}, 6:26003
Baudry, T.V., Using GIFTS on the Cray-1 for the large coil test facility test: stand design analysis, 6:26022 (ORNL/TM—7665)
Bauer, F., Beta limits for torsatrons, 6:26666
Baumbaugh, A.E., *See* Cason, N.M., 6:26493
Bauserman, G., *See* DeCorso, S.M., 6:25440
Bayazeed, A.F., *See* Lorenz, P.B., 6:25001
Beaudry, B.J., *See* Schirber, J.E., 6:25924
Beavan, L.A., *See* Price, R.J., 6:25948
Becker, M.C., *See* Glover, C.J., 6:24977
Beckjord, E.S., INFCE past midcourse, 6:25615
Beers, J.C. II, Strauss, H.L., *See* Alder, B.J., 6:26471
Beg, M.A.B., Dynamical symmetry breaking and hypercolor, 6:26545
Behr, R., Thin shell roof systems and construction techniques for earth sheltered housing, 6:25746
Beier, R.A., Soot volume-fraction profiles in a free-combusting boundary layer, 6:26011 (LBL—12767)
Belanger, P.L., Health hazard evaluation determination report no. HE 79-31-699, University Corporation for Atmospheric Research, Mauna Loa Observatory, Hilo, Hawaii 96720, 6:26151 (PB—81-111247)
Belian, R.D., *See* Baker, D.N., 6:26443
Belkov, A., *See* Ammar, R., 6:26504
Bell, A.T., *See* Fredrick, T.J., 6:24877
See Tanner, K.I., 6:24887
Bell, D.M., *See* Nelson, E.V., 6:25643
Bell, M., *See* Gagne, G., 6:25866
Bell, R.B., Energy/economic model analysis. Livermore energy policy model. Final report, 6:25596 (PB—81-114266)
Beltz, P.R., Mass burning of municipal solid waste - worldwide, 6:25846
Bender, C.M., Numerical computation of the renormalized effective potential in the strong-coupling limit, 6:26528
Strong-coupling expansion for the effective potential on a lattice, 6:26567
Bender, D., *See* Koester, L.J., 6:26499
Bender, T.M., *See* Ho, P.C., 6:25033
Bendixsen, R.B., Tank-farm-waste-volume projections, 6:25139 (RHO-CD—80-615)
Benedek, R., *See* King, W.E., 6:25920
Bengtson, C., Deposition of nitrogen oxides to Scots pine (Pinus sylvestris L.), 6:26342 (CONF-800365—, pp 154-155)
Benjamin, B.M., Novel method for controlled oxidation, 6:24908
Benock, G., *See* Walker, J.N., 6:25805
Benson, D.A., Method for fast pulsed thermal diffusivity measurements in thin films, 6:26614 (SAND—80-2694C)
Benson, D.K., *See* Jayadev, T.S., 6:25658
Bentley, G.E., *See* Barnes, J.W., 6:26007
See Wilhelmy, J.B., 6:26589
Benton, W.J., Studies of aqueous solutions and microemulsions for enhanced oil recovery processes, 6:25053 (DOE/BETC/IC—80/3(Vol.2), pp 11p, Paper 13)
Benz, S.L., *See* Schindler, J.E., 6:26219
See Waide, J.B., 6:26220
Beremand, D.G., Overview: DOE/NASA automotive gas turbine and Stirling projects, 6:25865 (DOE/NASA/51040—28)
Berg, D., Radiative widths of K and rho mesons, 6:26509
Berge, F., *See* Davis, R.B., 6:26272, 6:26274
Berger, E.I., Higher twist QCD terms in high-P/sub T/ pion production, 6:26533
Bergland, L.G., *See* Cain, W.S., 6:26400
Berglund, S., Compost from sludge and refuse: applications and quality requirements, 6:25836 (CONF-7909198—, pp 285-299)
Bergman, W., Electrostatic air filters generated by electric fields, 6:26162 (UCRL—84878)
Berk, H.L., *See* Bravenec, R.V., 6:26656
Berkner, K.H., H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)
Berkowitz, J., Photoionization of atomic iodine and atomic tellurium, 6:26447 (CONF-800626—8)
Photoionization of atomic iodine and atomic tellurium, 6:26467
Berman, M., Light water reactor safety research program. Quarterly report Jan-Mar 80, 6:25535 (NUREG/CR—1509)
Bernard, M.J. III., Projection of US transportation needs for beyond 1990: a market for advanced vehicles, 6:25879 (CONF-801242—7)
Bernhardt, D.E., *See* Smith, D.D., 6:26196
Berry, H.G., Foil dissociation of fast molecular ions into atomic excited states, 6:26449 (CONF-801111—49)
Bertasi, M., Fibrous insulating materials as standard reference materials at low temperatures, 6:25679
Bertolucci, B., *See* Logg, C.A., 6:26090
Betancourt, O., *See* Bauer, F., 6:26666
Betzig, H., *See* Hasselriis, F., 6:25827
Bharathan, D., *See* Green, H.J., 6:25320
Bhat, M.R., Evaluation of ^{232}Th for ENDF/B-V, 6:26595 (BNL-NCS—51360)
Bhatia, T.S., Zero-crossing angle in the np analyzing power at medium energies and its relation to charge symmetry, 6:26576
Bhattacharya, R.S., *See* Holloway, P.H., 6:25241
Bianucci, J.A., Compressor station noise-abatement: a case study, 6:25074
Bias, W.B., *See* Elfenbein, G.J., 6:26312
Bice, T.N., Energy performance characteristics of selected earth sheltered residences, 6:25696 (CONF-800438—, pp 33-42)
See Boyer, L.L., 6:25739
Bickel, T.C., *See* Thomas, M.G., 6:24882
Biel, J., *See* Berg, D., 6:26509
Bierle, D.A., *See* Dillon, R.D., 6:26230
Biermann, A.H., *See* Bergman, W., 6:26162
Bieszk, J.A., Collective and neutron-structure effects in the elastic scattering of vector polarized deuterons in the A = 90 mass region, 6:26584
Bigolaro, G., *See* Bertasi, M., 6:25679
Bild, R.W., Simultaneous determination of antimony and chlorine in synthetic rubbers by 14-MeV neutron-activation analysis, 6:25971 (SAND—81-0156C)
Billard, B.D., Spatial resolution for two-beam spectroscopy: a new mechanism, 6:26469
Bilotta, R.M., Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2^+ + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$, 6:26006
Bingham, C.R., Decay of /sup 199m,g/Po: isomeric transitions in ^{199}Po and ^{199}Bi, 6:26592 (CONF-810649—6)
Birdsall, T.H., Relaxing environmental standards during oil-supply disruptions: past, present and future, 6:26172 (DOE/PE/70278—T15)
Birenzvige, A., *See* Brookman, E.T., 6:26153
Birkby, J., *See* Perlmutter, S., 6:25392

Birkhan, P., *See* Niccum, M., 6:25391
Birtcher, R.C., *See* Averback, R.S., 6:25931
Bishop, C.T., *See* Styron, C.E., 6:24905
Bishop, J.M., *See* Cason, N.M., 6:26493
Biswas, D., Depletion analysis and sensitivity study of PHENIX fuel-irradiation experiments, 6:25489 (CONF-810606—56)
Biswas, N.N., *See* Cason, N.M., 6:26493
Bjoerseth, A., *See* Alfheim, I., 6:26118
Bjor, K., Effects of acid precipitation on soil and forest. 6. Lysimeter experiment in greenhouse, 6:26353 (CONF-800365—, pp 200-201)
Black, J.K., *See* Schmidt, M.P., 6:26560
Blair, B., *See* Barish, B., 6:26517
Blair, P.D., *See* Cassel, T.A.V., 6:25393
Blake, W.H., *See* Dowgiallo, E.J. Jr, 6:25877
Blase, E.F., *See* Oxley, J.H., 6:24966
Blatt, S.R., *See* Schmidt, M.P., 6:26560
Blaylock, J.A., *See* York, E.N., 6:26101
Blessing, J.E., *See* Ross, D.S., 6:24881
Blevins, R.D., Experiments on vibration of heat-exchanger tube arrays in cross flow, 6:26020 (GA-A—16161)
Blevins, R.P., Demonstration of a heat-pump water heater, 6:25710 (CONF-810672—10)
Blick, E.F., Simple method for determining heat flow through earth covered roofs, 6:25737
Bliesner, R.D., Economic analysis of life cycle costing irrigation pipe network design, 6:25808
Blinder, C.L., Land use and development trends in Dorchester and Wicomico counties, 6:25464 (PB—81-110249)
Prediction of socio-economic impacts by the proposed unit No. 9 at Vienna and alternative sites, 6:25448 (PB—81-110256)
Blocker, C.A., *See* Schindler, R.H., 6:26486
Blomeke, J.O., Disposal of nuclear wastes by transmutation, 6:25119 (CONF-810606—48)
Blondel, A., *See* Schindler, R.H., 6:26486
Bloom, S.A., *See* Crisman, T.L., 6:26363
Bloomquist, D.D., Shock compression temperature rise determined from resistivity of embedded metal foils, 6:25940 (SAND—80-2836C)
Bluhm, D.D., Analysis of dielectric heating and conductive cooling of pyrite in coal, 6:24948 (IS-M—311)
Blurton, K.F., *See* Bowman, R.M., 6:25672
Boatner, L.A., *See* Prater, R.L., 6:25958
Bobbett, R.E., *See* Lynn, D.K., 6:25670
Bobrov, E., *See* Tsukamoto, O., 6:26027
Bockrath, B.C., Evaluation of the donor ability of coal liquefaction solvents, 6:24874
Bockris, J.O'M, Basic research needs and opportunities at the solid-liquid interface, 6:25243 (CONF-8006156—, pp 151-166)
Overview of current status of solid/liquid interface science, 6:25238 (CONF-8006156—, pp 69-96)
Bodek, A., *See* Barish, B., 6:26517
Bodvarsson, G.S., Thermal effects in welltests of fractured reservoirs, 6:25401 (LBL—12076, pp 110-119)
See Mangold, D.C., 6:26475
Boekema, C., Muon states in the antiferromagnetic oxides α-Fe_2O_3 and $FeTiO_3$, 6:25950 (LA-UR—81-1017)
Bogomolov, K., *See* Ammar, R., 6:26504
Boies, D.B., Testing of lithium-sulfur dioxide cells for waste disposal hazards. Final report sep 79-mar 80, 6:25582 (AD-A—090785)
Boley, C.D., *See* Brooks, J.N., 6:26674
See Ehst, D.A., 6:26628
Boley, G.L., Development and implementation of prepared solid waste fuels to energy projects through the architectural/engineering approach, 6:25825 (ANL/CNSV-TM—60, pp 25-35)
Bollinger, L., *See* Smith, R.P., 6:26067
Bomberg, M., Blown cellulose fiber thermal insulations. Part 1. Density of cellulose fiber thermal insulation in horizontal applications, 6:25680
Influence of moisture and moisture gradients on heat transfer through porous building materials, 6:25752
See Shirtliffe, C.J., 6:25681
Bonett, D., *See* Ecock, E.J., 6:25446
Bonner, B.E., *See* Bhatia, T.S., 6:26576
Bonzon, L.L., Qualification testing evaluation program light-water reactor safety research. Quarterly report Jul-Sep 79, 6:25534 (NUREG/CR—1492)
Booker, C.P., *See* Gilbert, J.S., 6:25530
Booth, D.C., Stabilized CVD amorphous silicon for high temperature photothermal solar energy conversion, 6:25376
See Gaczi, P.J., 6:25961
Boozer, A.H., Force on a moving plasma by a finite conductivity wall, 6:26476
Tokamak microturbulence and the second law of thermodynamics, 6:26659
Transport and isomorphic equilibria, 6:26642 (PPPL—1804)
See Goldston, R.J., 6:26641
Borenstein, S., *See* Miller, M., 6:26483
Borghi, L.C., *See* Fraser, M.D., 6:25285
Borie, E., Calculation of the 3p-3d transitions in muonic helium, 6:26455
Borst, J., *See* Hausler, D.W., 6:24917
Borst, W.L., Longterm solar heat storage in an underground water cistern retrofitted with thermal insulation. Final technical report, May 15, 1979-March 31, 1981, 6:25380 (DOE/R5/10106—3)
Bos, P., Reducing the impact of margin ceilings on gasoline wholesalers. Final report, 6:25042 (PB—81-117160)
Bostick, W.D., Modified kit procedure for the kinetic assay of ethanol, 6:25196
Bostroem, C.A., *See* Bengtson, C., 6:26342
Boswell, J.S., *See* Minehart, R.C., 6:26491
Botkin, D.B., *See* Maguire, B. Jr., 6:26214
Bott, T.F., *See* Mahaffy, J.H., 6:25528
Boubel, G., *See* Behr, R., 6:25746
Boubel, R.W., USAF aircraft engine emission goals: a critical review. Final report Sep 78-Jun 79, 6:25853 (AD-A—090282)
Bowden, J.N., Stability characteristics of hydrocarbon fuels from alternative sources, 6:24902 (DOE/BETC/IC—80/3(Vol.4), pp 12p, Paper 12)
Bowden, J.R., Synfuels challenges and opportunities, 6:24970
Bowen, G.W., Quantitative analysis of forest island pattern in selected Ohio landscapes, 6:26176 (ORNL/TM—7759)
Bowen, V.T., Spiked sample standards; their uses and disadvantages in analytical quality control, 6:26169
Bowen, W.W., Rhenium muffle tube fabricated by CVD for application in 1800°C high thermal efficiency fuel processing furnace, 6:25904 (HEDL-SA—2137)
See Svedberg, R.C., 6:25908
Bowles, R., Overview of aviation energy programs and supply problems, 6:25758
Bowling, J.W., Large-scale microcosms for assessing fates and effects of trace contaminants, 6:26221
Bowman, E.K., *See* Miller, W.M., 6:25357
Bowman, J.D., *See* Lockyer, N., 6:26502
Bowman, M.G., *See* Mason, C.F.V., 6:25177
Bowman, R.C. Jr., Nuclear magnetic resonance studies of hydrogen in TiCrsub(1.8)Hsub(x), 6:25936
Bowman, R.M., Fuel cell support studies: on-site molten carbonate systems. Final report 1 Dec 78-30 Nov 79, 6:25672 (PB—81-113672)
Boyack, B.E., *See* Gilbert, J.S., 6:25530
Boyarski, A.M., *See* Schindler, R.H., 6:26486
Boyd, D.W., Molybdenum-tin as a solar cell metallization system, 6:25279
Boyd, R.E., *See* York, E.N., 6:26101
Boyer, K.G., *See* Morris, C.L., 6:26579
Boyer, L.L., Energy usage in earth covered dwellings in Oklahoma, 6:25739
Proceedings: earth sheltered building design innovations, 6:25732
See Bice, T.N., 6:25696
See Grondzik, W.T., 6:25697
See Weber, M.J., 6:25744
Boyer, W.B., *See* Neau, E.L., 6:26711
Boykin, W.B., *See* Combes, R.S., 6:25816
Boynton, W.R., *See* Kemp, W.M., 6:26247
Braak, C.T., *See* Van Dam, H., 6:26364
Bracker, S., *See* Martin, J., 6:26077
Braekke, F.H., Sulfate dynamics in natural environments. Preliminary results from a case study, 6:26140 (CONF-800365—, pp 156-157)
Brakke, D.F., Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. III. Cladoceran community structure and stratigraphy, 6:26273 (CONF-800365—, pp 272-273)
See Davis, R.B., 6:26274
See Jones, H.G., 6:26255
Brand, S.W., Geochemical characterization of petroleum using carbon, sulfur, hydrogen and nitrogen stable isotopes, 6:25055 (DOE/BETC/IC—80/3(Vol.4), pp 13p, Paper 1)
Bravenec, R.V., Viscous plasma flow in a multiple-mirror configuration, 6:26656
Breault, R.W., *See* Mathur, V.K., 6:24841
Bredehoeft, J.D., *See* Neuzil, C.E., 6:26412
Breidenbach, M., *See* Schindler, R.H., 6:26486
Breig, M.L., *See* Policastro, A.J., 6:25460
Bremer, S.A., *See* Yamartino, R.J., 6:26109
Bremner, J.M., Sorption of pollutant gases by soils. Final report, December 1, 1974-November 30, 1980, 6:26191 (DOE/EV/02530—17)

Brench, B.L., *See* Jarvinen, P.O., 6:25578
Brenneman, R.L., Policy overview of the issues of waste flow control, 6:25629 (ANL/CNSV-TM—60, pp 435-442)
Bretthauer, R., Laboratory aquatic microcosms, 6:26229
Breuer, H., *See* Awes, T.C., 6:26599
Brewer, S.T., DOE nuclear program--promise and perspective, 6:25614
Brezonik, P.L., *See* Crisman, T.L., 6:26363
See Hendry, C.D., 6:26125
Bricard, A., *See* Alleau, T., 6:25766
Bridges, J., rf heating of Utah tar sands. Final report, October 1978-December 1979, 6:25083 (DOE/CH/90035—4)
Briggs, R.B., *See* Osborne, M.F., 6:25484
Brigham, W.E., *See* Soliman, M., 6:25034
Bright, J.A., Oilfield water analysis data bank and estimates of water available for enhanced oil recovery in the northern shelf area of Oklahoma, 6:24978 (DOE/BETC/IC—80/3(Vol.1), pp 3p, Paper 3)
Brimhall, J.L., Summary of comparative dual-ion-irradiation experiment on 316 stainless steel, 6:25909 (PNL-SA—9255)
Brinkman, C.R., *See* Swindeman, R.W., 6:25899
Brinkman, D., *See* Reynolds, J.W., 6:25046
Brinkman, D.W., Used oil recycling, 6:25043 (DOE/BETC/IC—80/3(Vol.4), pp 5p, Paper 9)
See Sutterfield, F.D., 6:24900
Brister, B.M., *See* Nissan, E., 6:26160
Britton, J.C., Freshwater bivalve mollusca (unionidae, sphaeriidae, corbiculidae) of the Savannah River Plant, South Carolina, 6:26211 (SRO-NERP—3)
Brochard, F., *See* Zarbakhsh, F., 6:26488
Brockman, P., *See* Dankowych, J.A., 6:26492
Brode, R., Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)
Brodsky, M.B., Basic research needs and opportunities at the solid/gas interface, 6:25244 (CONF-8006156—, pp 167-182)
Brodsky, S.J., Structure functions and high twist contributions in perturbative quantum chromodynamics, 6:26548
Structure functions and high twist contributions in perturbative quantum chromodynamics, 6:26553
Brody, T.A., Random-matrix physics: spectrum and strength fluctuations, 6:26606
Broend, E., Energy auditing in connection with subsidy schemes for energy saving investments, 6:25793 (CONF-7910214—, pp vp, 14p)
Brogan, T.R., Subsonic diffusers for MHD generators, 6:25653
Brogaonkar, D.S., *See* Elfenbein, G.J., 6:26312
Bronner, G., *See* Vogel, H.F., 6:26633
Brookman, E.T., Exposure to pollutants from domestic combustion sources: a preliminary assessment. Final report Aug 79-Feb 80, 6:26153 (PB—81-111536)
Brooks, A.L., *See* Hawke, R.S., 6:26026
Brooks, C., *See* Walter, D.K., 6:25187
Brooks, J., *See* Abdou, M., 6:26681
Brooks, J.N., STARFIRE burn cycle, 6:26674 (CONF-801011—89)
See Baker, C.C., 6:26678
Brooks, R.L., *See* Berry, H.G., 6:26449
Brooksbank, R.D., *See* Stewart, J.H. Jr., 6:25964
Brouzes, R.J.P., *See* Tomlinson, G.H., 6:26133
Brown, C., *See* Abshire, G., 6:26498
Brown, C.H. Jr., Transient modeling of froth flotation and vacuum filtration processes, 6:24946 (CONF-810607—8)
See Canright, G.S., 6:24947
Brown, C.L., Effectiveness of criticality safety technology, 6:25513 (HEDL-SA—2373-FP)
Brown, C.M., Risk comparison of centralizing or decentralizing processing facilities for defense transuranic waste, 6:25169 (RFP—3159)
Brown, D.J.A., Fish and freshwater chemistry, 6:26359 (CONF-800365—, pp 280-281)
See McWilliams, P.G., 6:26360
See Rippon, J.E., 6:26275
Brown, G., *See* Winick, H., 6:26073
Brown, J.A., Receipt and preparation of biomass as an energy source., 6:25451
Brown, K.A., *See* Rippon, J.E., 6:26275
Brown, K.C., Industrial applications analysis: market characterization and system definition for several industries, 6:25348 (SERI/TP—353-467)
Brown, P.J., *See* Lander, G.H., 6:25962
Brown, R., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Brown, R.C., *See* Heller, E.J., 6:26621
Brown, R.E., Review of water-well data from the unconfined aquifer in the eastern and southern parts of the Pasco Basin, 6:26417 (RHO-BWI-C—56)
See Cizewski, J.A., 6:26594
See Flynn, E.R., 6:26590
See Wilhelmy, J.B., 6:26589
Brown, W.T., Numerical modeling of oblique hypervelocity impact using two-dimensional plane strain models, 6:26023 (SAND—80-2865C)
Brubaker, I., *See* Malloy, T.P., 6:25039
Bruetsch, R.I., Technical feasibility of the proposed 1982-1983 high altitude standards for light duty vehicles and light duty trucks. Technical report, 6:25873 (PB—81-118630)
Brummond, W.A., *See* Germer, J.H., 6:25504
Brustad, K., *See* Christophersen, N., 6:26205
Buchele, W.F., *See* Claar, P.W. II, 6:25277
Buchmueller, W., Quarkonia and quantum chromodynamics, 6:26523
Buck, O., *See* Morris, W.L., 6:25906
Buck, R.M., *See* West, H.I. Jr., 6:26442
Buckley, B.A., *See* Nixon, S.W., 6:26244
Buckman, R.W. Jr., *See* Svedberg, R.C., 6:25908
Buckner, A.T., *See* Cady, W.E., 6:25941
Buckwalter, C.Q., Correlations between pH and glass leaching, 6:25134 (PNL-SA—9102)
Buddemeier, R.W., *See* Toy, A.J., 6:26200
Buden, D., Acceptability of reactors in space, 6:25527 (LA-UR—81-1371)
Budgor, A.B., Deformable mirror study. Final report, 21 July 1980-15 May 1981, 6:26689 (DOE/DP/40052—T1)
Budnitz, R.J., Response of the Nuclear Regulatory Commission to the accident at Three Mile Island, 6:25556
Budoff, H., Private sector viewpoint of waste flow control for the DOE/EPA conference on prepared fuels and resource recovery technology, 6:25832 (ANL/CNSV-TM—60, pp 469-482)
Buelt, J.L., *See* Hartley, J.N., 6:25133
Buhrman, R.A., *See* Craighead, H.G., 6:25265
Bullin, J.A., Analytical and experimental assessment of highway impact on air quality: data analysis and model evaluation. Research report (final) Sep 74-21 Jan 80, 6:26159 (PB—81-114738)
Bunshah, R.F., *See* Arthur, J.R., 6:25246
Bunting, D.L., Thermal stress studies on selected zooplankton species and an isopod, 6:26326 (PB—81-115610)
Bunyatov, S., *See* Ammar, R., 6:26504
Buras, A.J., Quantum chromodynamics and deep-inelastic scattering, 6:26552
Burchfield, T.E., *See* Good, W.D., 6:25059
Burgess, H., Integrated architectural and mechanical design for the Arizona State University energy efficient house and laboratory, 6:25733
Burgess, R.L., *See* Bowen, G.W., 6:26176
Burke, D.G., *See* Cizewski, J.A., 6:26594
See Flynn, E.R., 6:26590
Burke, D.L., *See* Schindler, R.H., 6:26486
Burke, F.P., Reverse phase liquid chromatography of coal liquefaction solvents, 6:25972
Burke, J., Cannon shredding of municipal solid waste for the preparation of biological feedstock. Final report, 6:25837 (DOE/CE/20088—01)
Burke, P., Community environmental education: three models of organization for PSD Set II. Final report, 6:25606 (PB—81-118721)
Burke, R., *See* Martin, R.L., 6:26668
Burke, R.J., *See* Martin, R.L., 6:26685
Burkhardt, L.C., Internal magnetic probe data from ZT-40, 6:26694 (LA—8753MS)
Burlet, P., Neutron diffraction study of USbsub(1-x)Tesub(x) solid solutions, 6:25963
Burnet, G., Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980, 6:24929 (IS—4773)
See Murtha, M.J., 6:24933
Burnett, T., *See* Ammar, R., 6:26504
Burnham, D., Press and nuclear energy, 6:25546
Burns, A.L., *See* Sato, N., 6:25480
Burns, R.D. III, *See* Dobranich, D., 6:25529
Burns, T.J., Criterion for thermo-plastic shear instability, 6:25914 (SAND—81-0041C)
Burrill, G., *See* Cabraal, R.A., 6:25297
Burt, J.E., *See* Viecelli, J.A., 6:26289
Busch, G.E., *See* Slater, D.C., 6:26662
Bush, D.M., *See* Verardo, A.E., 6:25589
Bush, R.C., *See* Bianucci, J.A., 6:25074
Bushuk, B.A., Picosecond spectroscopy of polar dye solutions at antistokes excitation, 6:25995 (UCRL-Trans—11679)

Bussmann, W., Isotope effect in niobium self-diffusion, 6:25918
Butcher, B.M., Elastic-plastic mechanical constitutive description for rock salt triaxial compression, 6:25142 (SAND—80-1935)
Butler, B.L., Basic research needs and opportunities at the solid/solid interface: adhesion, abrasion, and polymer coatings, 6:25245 (CONF-8006156—, pp 183-197)
Design requirements for interfaces in solar energy conversion technologies, 6:25235 (CONF-8006156—, pp 25-34)
Butler, G.B., *See* Butler, B.L., 6:25245
Butler, P.C., *See* Verardo, A.E., 6:25589
Butler, T.A., *See* Knapp, F.F., 6:26311
Byer, R.L., Efficient second-harmonic generation of Nd:YAG laser radiation using warm phasematching $LiNbO_3$, 6:26036
Byrd, B.L., *See* Jay, M., 6:26008

C

Cabeal, J.A., *See* Rudnicki, M.I., 6:25078
Cable, J., *See* Gears, G.E., 6:25533
Cabraal, R.A., Market assessment of photovoltaic power systems for agricultural applications in the Philippines, 6:25297 (DOE/NASA/0180—1)
Cacuci, D.G., *See* Maudlin, P.J., 6:25520
Cada, G.F., Effects of sublethal entrainment stresses on the vulnerability of juvenile bluegill sunfish to predation, 6:25462 (ORNL/TM—7801)
Cadwell, L.L., *See* Fitzner, R.E., 6:26177
Cady, K.B., Importance theory for lumped-parameter systems, 6:25526 (HEDL-SA—2329-FP)
Cady, W.E., Evaluation of organic peroxides as curing agents for methylphenylvinyl-siloxane elastomers used for cellular silicone cushions, 6:25941 (UCRL—53124)
Cafasso, F.A., *See* Bockris, J.O'M, 6:25243
Caffrey, A.J., *See* Wells, J.C., 6:26586
Cain, W.S., Ventilation requirements for control of occupancy odor and tobacco smoke odor: laboratory studies. Final report, 6:26400 (LBL—12589)
Caines, L.A., *See* Wright, R.F., 6:26264
Caines, M.J., *See* Kupperman, D.S., 6:25934
Caird, R.S., *See* Fowler, C.M., 6:26635
Cairns, J. Jr., *See* Rodgers, J.H. Jr., 6:26238
Calavan, P.M., *See* Roeske, F., 6:26083
Call, P.J., Overview of solar energy conversion technologies: quantum processes and thermal processes, 6:25234 (CONF-8006156—, pp 9-24)
See Arthur, J.R., 6:25246
Callahan, A.P., *See* Jay, M., 6:26008
See Knapp, F.F., 6:26311
Callahan, D., *See* Mick, C., 6:25327
See Mick, C.K., 6:25849
Callahan, T.F., Computer analysis to compare the energy consumption of variable and constant speed pumps for agricultural irrigation, 6:25810
Callcott, T.A., *See* Chung, M.S., 6:26472
Calvin, M., *See* Mettee, H., 6:25266
Camaioni, D.M., *See* Franz, J.A., 6:24875
Cambourelis, P.J., *See* Schroeder, R.L., 6:26057
Camirand, W.M., *See* Randall, J.M., 6:25817
Camp, D.C., *See* Ruhter, W.D., 6:25174
Campbell, J.A., Waste fuel densification: review of the technology and applications, 6:25202 (ANL/CNSV-TM—60, pp 135-153)
Campbell, J.H., Analysis of the operation of Occidental's Modified In-Situ Retort 6, 6:25087 (UCRL—85312)
See Raley, J.H., 6:25086
Campbell, L.J., Transverse normal modes of finite vortex arrays, 6:26477
Campbell, M.K., *See* Schmidt, M.P., 6:26560
Campbell, T.C., *See* Weinbrandt, R.M., 6:25003
Canfield, D., *See* Kline, G., 6:25268
Cannata, P.E., *See* Cason, N.M., 6:26493
Cannon, T.M., *See* Fenimore, E.E., 6:26623
Canright, G.S., Dynamic simulation of the coal froth flotation and filtration processes, 6:24947 (CONF-810607—10)
See Brown, C.H. Jr., 6:24946
Cape, J.N., *See* Fowler, D., 6:26341
See Nicholson, I.A., 6:26137
Cape, N., *See* Nicholson, I.A., 6:26136, 6:26138
Caponi, M.Z., *See* Liewer, P.C., 6:26038
Capp, J.P., Uncovering and evaluation of a twenty-five-year-old underground-coal-gasification burn at a site in Gorgas, Alabama, 6:24856 (DOE/MC/17783—T1)
Carhart, R.A., *See* Policastro, A.J., 6:25459
Carithers, W.C., *See* Schindler, R.H., 6:26486
Carlisle, C.T., Development of a rapid and accurate method for determining partition coefficients of chemical tracers between oils and brines (for single well tracer test), 6:24984 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 9)
Carlos, W.E., Interaction between a He atom and a graphite surface, 6:26474
Carlsson, L., *See* Almen, K.E., 6:26405
Carman, R.L., Influences on target irradiation symmetry in CO_2 laser-fusion experiments, 6:26698 (LA-UR—81-1566)
Carmichael, J.D., Alkaline waterflooding demonstration project Ranger Zone, Long Beach Unit, Wilmington Field, California, 6:25005 (DOE/BETC/IC—80/3(Vol.2), pp 8p, Paper 5)
Carreras, B.A., *See* Hicks, H.R., 6:26637
Carroad, P.A., *See* Pedersen, L.D., 6:25814
Carroll, H.B., *See* Jennings, J.B., 6:24999
Carroll, H.B. Jr., *See* Volk, L.J., 6:24997
Carroll, J.B., *See* Zarbakhsh, F., 6:26488
Carter, B.D., *See* Schneider, R.T., 6:26453
Carter, H.K., *See* Bingham, C.R., 6:26592
Caruso, L., *See* Simmons, G., 6:25089
Carver, D.W., Bus annunciator system, 6:25757 (Y—2244)
Cary, J.R., Ponderomotive effects in collisionless plasma: A Lie transform approach, 6:26647
Casavecchia, P., Interaction potentials for $Br(^2P)+Ar$, Kr, and Xe (^1S) by the crossed molecular beams method, 6:26460
Casella, V.R., *See* Styron, C.E., 6:24905
Cashion, J.D., Superconductivity and magnetism in the series $R_2Fe_5Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
Cason, N.M., General features of the reaction $\pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$ at 8 GeV/c, 6:26493
Cassel, T.A.V., Geothermal well-field and power-plant investment-decision analysis, 6:25393 (DOE/ET/27242—T1)
Cathcart, J.V., *See* Brodsky, M.B., 6:25244
Catto, P.J., *See* Tang, W.M., 6:26655
Cavagnaro, D.M., Nitrogen oxide air pollution: biological effects. 1964-August, 1980 (citations from the NTIS data base). Report for 1964-Aug 80, 6:26390 (PB—81-800203)
Cayton, T.E., Finite ion Larmor radius stabilization of m = 1 modes of a high-β screw pinch, 6:26651
Cederwall, R.T., *See* Meyers, R.E., 6:26114
Celmaster, W., QCD corrections to quarkonia decays, 6:26551
Cerda, E.G., *See* Ecock, E.J., 6:25446
Cernansky, N.P., Physical and chemical phenomena responsible for odor formation in diesel engines. Interim progress report Jul 78-Dec 79, 6:25874 (PB—81-119166)
Chacinski, V., *See* Dooley, R.B., 6:24961
Chaffin, R.J., Resonant mode PIN switch, 6:26053
Chan, C., Factorization relations and consistency conditions in the sudden approximation, 6:26461
Chan, M., *See* Yen, T.F., 6:25027
Chan, S.M., *See* Sato, N., 6:25480
Chandarana, D., *See* Frey, B.C., 6:25813
Chandlee, C., *See* Berg, D., 6:26509
Chaney, J.E., *See* Jay, M., 6:26008
Chang, L.W., *See* Squires, T.G., 6:24911
Chang, R., Modeling of heated surface jets. Final technical report, 6:26295 (PB—81-116857)
Chao, K.T., (cc)-(anti canti c) (diquark-antidiquark) states in e^+e^- annihilation, 6:26554
Chapman, G.T., *See* Santoro, R.T., 6:26629
Chapman, J.N., MHD/steam electrical power production-a status report, 6:25656
Charatis, G., *See* Slater, D.C., 6:26662
Charlot, L.A., *See* Brimhall, J.L., 6:25909
Chase, L.L., *See* Prater, R.L., 6:25958
Chato, J.C., Free and forced convective cooling of pipe-type electric cables. Volume 1: forced cooling of cables. Final report, 6:25478 (EPRI-EL—1872)
Free and forced convective cooling of pipe-type electric cables. Volume 2: electrohycrodynamic pumping. Final report, 6:25479 (EPRI-EL—1872(Vol.2))
Chatterjee, N., Load-change testing of a large commercial oxygen plant. Final report, 6:24862 (EPRI-NP—1824)
Chatzis, I., *See* Morrow, N.R., 6:24986
Chau, K.V., *See* Baird, C.D., 6:25359
Chau Wang, L., Quark flavor mixing and its physical implications, 6:26547
Chauhan, S.P., *See* Feldman, H.F., 6:25190
See Feldmann, H.F., 6:25186

Che, S.C., *See* Durai-Swamy, K., 6:24859
Chein, C.L., Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ under external magnetic fields, 6:25897 (CONF-801134—16)
Chen, C., *See* Summers, K., 6:25395
Chen, C.B., *See* Durai-Swamy, K., 6:24859
Chen, C.H., *See* Hurst, G.S., 6:26451
Chen, C.W., *See* Goldstein, R.A., 6:26266
Chen, F.C., OTEC gas-desorption studies, 6:25314 (CONF-810622—2)
Chen, H.S., *See* Chein, C.L., 6:25897
Chen, J.W., Measuring and controlling the fouling film formation of HB-40 organic coolant, 6:25487
Chen, W.L., *See* Chou, K.D., 6:26322
Chen, Y.Y., *See* Venier, C.G., 6:24909
Cheper, N.J., *See* Bunting, D.L., 6:26326
Cherniavsky, E.A., Long-range oil and gas supply methodology: proposed reformulation, 6:25626 (BNL—51359)
Cherry, J.A., *See* Groenewold, G.H., 6:24927
Chertok, B.T., *See* Rock, S., 6:26511
Chester, S.O., *See* Gardner, J.F., 6:24855
Cheung, K.C., Assessment of long-term structural behavior of an asymmetric multi-cavity PCRV, 6:25486 (GA-A—16269)
Chhabildas, L.C., Reshock and release behavior of beryllium, 6:25913 (SAND—80-2864C)
Sandia shock thermodynamics applied research facility, 6:26047 (SAND—81-1528C)
See Asay, J.R., 6:25912
Chikalla, T.D., Nuclear waste management. Quarterly progress report, January-March, 1981, 6:25130 (PNL—3000-9)
Child, J., *See* Wisenberg, G., 6:26309
Childers, W.F., *See* Griffin, R.A., 6:24930
Childs, W.J., Hyperfine and spin—rotational structure of CaBr X $^2\Sigma$ (v = 0) by molecular-beam laser-rf double resonance, 6:26456
Chilenskas, A.A., *See* Barney, D.L., 6:25585
Chinowsky, W., *See* Schindler, R.H., 6:26486
Chisholm, R.F., Behavioral and mental health effects of the Three Mile Island accident on nuclear workers: a preliminary report, 6:25551
Chism, J.E., *See* Collins, A.G., 6:24976
Chiu, C.B., Review on DTU-parton model for hh and hA collisions, 6:26531
Chiu, J.H., Simple and effective method for measurement of HTO and HT in environmental air, 6:25975
Choi, B., *See* Wysk, R.A., 6:25431
Choi, M., *See* Noreen, D., 6:25328
Choi, P.S., *See* Feldmann, H.F., 6:25186
Chopra, P.S., *See* Hwang, I.T., 6:25379
See Singh, I., 6:25326
Chou, C.C., *See* Pung, T.C., 6:25974
Chou, K.D., Radiological protection program for a tritium luminous dial painting plant, 6:26322
Chou, S.I., Dielectric relaxation of oil-external microemulsions, 6:25994
Chou, T.T., Dip and kink structures in high energy diffraction dissociation processes, 6:26530
Chowdhuri, P., *See* Weldon, D., 6:26695
Chraplyvy, A.R., High-resolution spectroscopy of matrix-isolated ReO_4^- molecules, 6:25929
Christensen, H.F., Implementation of a resource recovery program: full service approach, 6:25824 (ANL/CNSV-TM—60, pp 17-23)
Christianson, C.C., Near-term batteries for electric vehicles, 6:25586 (CONF-810315—13)
See Yao, N.P., 6:25584
Christophersen, N., Sulfate at Birkenes, a small forested catchment in southernmost Norway, 6:26277 (CONF-800365—, pp 286-287)
Water residence distributions, 6:26205 (CONF-800365—, pp 284-285)
See Dahl, J.B., 6:26183
See Dymbe, L., 6:26278
Chrost, L., Effect of calcium on the toxicity of zinc and lead compounds in the water medium, 6:26362 (CONF-800365—, pp 294-295)
Chu, T.J., *See* Chen, J.W., 6:25487
Chu, Y., *See* Barish, B., 6:26517
Chuang, K.C., Desulfurization of coal by oxidation in alkaline solutions, 6:24867 (IS-M—318)
Chuang, Y.D., *See* Hamasaki, M., 6:25932
Chung, H.M., *See* Brand, S.W., 6:25055
Chung, K.S., Calculational method for combined natural circulation and forced-convection flow in a channel, 6:25518 (CONF-800723—26)
Study of turbulent natural-circulation flow and low-Prandtl-number forced-convection flow, 6:25519 (CONF-800723—27)
Chung, M.S., Radiation from silver films bombarded by low-energy electrons, 6:26472
Chung, S.U., Search for narrow BB (π) states in 16 GeV/c π^- p and 5 GeV/c p-barp interactions, 6:26494
Chynoweth, D.P., *See* Jerger, D.E., 6:25194
Ciboit, J., Energy savings in milk production: mechanical vapour-recompression concentration (comparison to classical technology), 6:25772 (CONF-800272—, pp 143-169)
Cignatta, J.V., *See* Bowles, R., 6:25758
Cihangir, S., *See* Berg, D., 6:26509
Ciliberti, D.F., Evaluation of ceramic fiber filters for hot gas cleanup in pressurized fluidized-bed combustion power plants, 6:25444 (EPRI-CS—1846)
Cipolletti, J.P., Kube Pak commercial greenhouse solar demonstration project, 6:25356
See Roberts, W.J., 6:25729
Cizewski, J.A., Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
See Flynn, E.R., 6:26590
Claar, P.W. II, Development of a concentric-vortex agricultural-residue furnace, 6:25277
Economic and energy analysis of potential corn-residue harvesting systems, 6:25276
Clark, A.R., Open and hidden charm muoproduction, 6:26500
Clark, G., *See* Rudzki, J.E., 6:25226
See Wolff, W.J., 6:25227
Clark, J.B., *See* Munnecke, D.M., 6:24991
Clark, J.N., Characterization of mucin isolated from rat tracheal transplants, 6:26304
Clark, J.R., *See* Rodgers, J.H. Jr., 6:26238
Clark, M.N., Ground rupture and seismic shaking as separate hazards of active faults (a study of active faulting in the Ojai Valley, Southern California), 6:26423
Clark, P.J., *See* Schindler, J.E., 6:26219
See Waide, J.B., 6:26220
Clark, R.G., *See* Glassey, C.R., 6:25612
Clark, R.N., Wind assisted deep-well pumping, 6:25429
See Lansford, R.R., 6:25430
Clarkson, J.E., *See* Campbell, J.H., 6:25087
Cleland, J.G., *See* Nichols, D.G., 6:24940
Clemmer, R.G., Development of tritium breeding blankets for DT-burning fusion reactors, 6:26677 (CONF-801011—92)
See Finn, P.A., 6:26673
See Smith, D.L., 6:26675, 6:26680
Clesceri, N.L., Acid precipitation, throughfall chemistry and canopy processes, 6:26189 (CONF-800365—, pp 258-259)
Cleveland, J.J., Ceramic recuperators for industrial flue-gas energy recovery, 6:25775 (CONF-800272—, pp 185-197)
Clikeman, F.M., *See* Ott, K.O., 6:25497
Clinard, L., An evaluation of air pollution abatement relaxation strategies for Tennessee during periods of pending or actual energy emergencies. (Tennessee State science, engineering, and technology project). Final report, 6:25605 (PB—81-114605)
Cline, D.B., Some comments on superhigh energy antiproton-proton colliders, 6:26074
Cline, K.M., Estimating seismic hazards using past rupture patterns of faults near the eastern Snake River Plain, Idaho, 6:26424
See Niccum, M., 6:26422
Coates, R.L., Demonstration project for methane recovery from deep coal seams, 6:24944
Coats, D.W., Evaluation of the seismic integrity of a plutonium-handling facility, 6:25170 (UCRL—85458)
See Murray, R.C., 6:25171
Coats, J.R., Stream microcosm for environmental assessment of pesticides, 6:26395
Cochrane, J.C., *See* Lipson, J., 6:26646
Coggins, J.L., *See* Statt, T.G., 6:25719
Cohen, A.E., Evaluation of military radiac equipment, 6:26100 (AD—460281)
Cohen, B.M., *See* Rice, R.E., 6:25579
Cohen, D., *See* Pierson, E.S., 6:25646, 6:25648
Cohen, J.J., Risk assessment and radioactive waste management, 6:25117 (CONF-801217—, pp 303-314)
See Smith, C.F., 6:25118
Cohen, J.S., Diabatic-state treatment of negative-meson moderation and capture. I. The hydrogen atom, 6:26464
Cohen, R.H., *See* Matsuda, Y., 6:26645
Cohen, R.S., *See* Cernansky, N.P., 6:25874
Cohen, S., Energy/economic model analysis. Volume 1: gas technology assessments using three energy

supply/demand integrating models. Final report, 6:25593 (PB—81-114225)
Energy/economic model analysis. Volume 2: evaluation of energy supply/demand integrating models. Final report, 6:25594 (PB—81-114233)
Cok, D.R., *See* Childs, W.J., 6:26456
Cole, C.V., *See* Elliott, E.T., 6:26180
Cole, L.K., Environmental destinies of insecticides, herbicides, and fungicides in the plants, animals, soil, air, and water of homologous microcosms, 6:26397
Cole, M.W., *See* Carlos, W.E., 6:26474
Coleman, A.J., The adsorption and electrooxidation of simple hydrocarbons for direct oxidation hydrocarbon-air fuel cells, 6:25662 (AD-A—090377)
Coleman, D.C., *See* Elliott, E.T., 6:26180
Coleman, R., *See* Barish, B., 6:26517
Coleman, R.C., Financial aspects of coal transportation by rail. Final report Oct 78-Sep 79, 6:24951 (PB—81-110868)
Coles, M.W., *See* Schindler, R.H., 6:26486
Collick, B., *See* Berg, D., 6:26509
Collins, A.G., Characterization of the domestic oil resource for enhanced oil recovery, 6:24976 (DOE/BETC/IC—80/3(Vol.1), pp 7p, Paper 1)
Collins, J.J., *See* Dixon-Davis, D.K., 6:26393
Colston, E.W., *See* Rhorer, R.L., 6:26021
Colvin, T.S., *See* Claar, P.W. II, 6:25276
Combes, R.S., Heat recovery/thermal energy storage for energy conservation in food processing, 6:25816
Comly, J.B., *See* Martin, F.J., 6:25861
Cone, B.W., *See* Bliesner, R.D., 6:25808
Conkle, H.N., *See* Feldmann, H.F., 6:25186
Conley, P.L., Demonstration of a helical armature for a superconducting generator, 6:25481
Conner, W.D., Granny's Creek CO_2 injection project, clay county, west virginia., 6:25037
Conroy, N., *See* Keller, W., 6:26358
See Wright, R.F., 6:26285
Cook, D.L., *See* Freeman, J.R., 6:26707
Cook, G.R., Earth, energy, architecture and steel culvert construction, 6:25747
Cooley, W.B., *See* Hausler, D.W., 6:24917
Cooper, F., *See* Bender, C.M., 6:26528, 6:26567
Cooper, G.K., *See* Dunn, W.E., 6:25461
Cooper, J., *See* Koester, L.J., 6:26499
Cooper, J.H., *See* Gilai, D., 6:25507
Cooper, S., *See* Schindler, R.H., 6:26486
Copeland, B.J., *See* Kitchens, W.M., 6:26235
Coppage, D., *See* Ammar, R., 6:26504
Cormell, L., *See* Abshire, G., 6:26498
Cort, G.E., *See* Duerre, K.H., 6:25532
Costin, L.S., *See* Burns, T.J., 6:25914
Cotanch, S.R., Theoretical nuclear structure studies using kaons and alpha particles. Progress report, June 1, 1980-May 31, 1981, 6:26602 (DOE/ER/10407—2)
Cottingame, W.B., *See* Morris, C.L., 6:26579
Cotton, F.O., *See* Brinkman, D.W., 6:25043
See Sutterfield, F.D., 6:24900
Cox, B., Direct single photon production and a search for diphoton resonance or continuum production at Fermilab energies, 6:26497
Craft, S.R., *See* Weinstein, K.D., 6:25044
Craig, F.F. III, Enhanced oil recovery by improved waterflooding in the Storms Pool Field, Illinois, 6:25008 (DOE/BETC/IC—80/3(Vol.2), pp 7p, Paper 8)
Craighead, H.G., Graded-index Pt-Al_2O_3 composite solar absorbers, 6:25265
Cramer, E.R., Thermal hydraulic analysis of the FFTF core usng SUPERENERGY-2, 6:25510 (HEDL-SA—2194)
Cramer, S.N., *See* Ingersoll, D.T., 6:25496
Crandall, E., *See* Abshire, G., 6:26498
Cremaschi, P., Chemisorption theory: Dissociation of H_2 on Ti(0001), 6:25927
Creutz, M., Quark confinement, 6:26537
Crisman, T.L., Acid precipitation: the biotic response in Florida lakes, 6:26363 (CONF-800365—, pp 296-297)
Crocker, M., Environmental aspects and fluid flow characteristics of EOR systems, 6:25047 (DOE/BETC/IC—80/3(Vol.1), pp 7p, Paper 19)
Croff, A.G., *See* Blomeke, J.O., 6:25119
Cronan, C.S., Impact of acid precipitation on forest canopies and soils in the northeastern US, 6:26343 (CONF-800365—, pp 158-159)
Cronauer, D.C., Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly progress report, September-November 1980, 6:24858 (DOE/PC/30080—T3)
Croney, S.T., *See* Mandler, J.W., 6:25536
Crooks, E.A., WHC: a multi-dimensional model of water movement, heat flow, and chemical transport in complex aquifer systems, 6:26287 (ORNL/TM—7564)
Crow, M.E., *See* Taub, F.B., 6:26215, 6:26234
Crowe, J.L., Evaluation of 10-MW Shawnee cocurrent scrubber. Final report, 6:25453 (EPRI-CS—1806)
Crowley, J.M., *See* Chato, J.C., 6:25478, 6:25479
Crumpton, W.G., Differential effects of growth and loss processes in controlling natural phytoplankton populations, 6:26208 (DOE/EV/01599—T1(Pt.3))
Cuddihy, E.F., *See* Garcia, A. III, 6:25278
Cumalat, J.P., Measurement of the J/psi photoproduction cross section, 6:26501
Cunningham, E.A., *See* Evans, L.S., 6:26331
Cunningham, J.A., Economical and reliable disposal and solid waste by Combustion Engineering, Inc. the domestic supplier of energy systems worldwide, 6:26058 (ANL/CNSV-TM—60, pp 285-317)
Cunningham, J.J., *See* Kemp, W.M., 6:26247
Cunningham, P.T., *See* Johnson, S.A., 6:26111
Cunningham, W.G., *See* Karo, A.M., 6:26615
Cuozzo, L., Solar housing in Italy: a project in Pisa, 6:25372
Curran, L.M., *See* Ballantyne, W.E., 6:25205
See Feldman, H.F., 6:25190
Curry, R.L., *See* Sowell, E.F., 6:25390
Curtis, C.W., *See* Tarrer, A.R., 6:24861
Curtis, S.A., Initial assessment of the effects of energetic-ion injections in the magnetosphere due to the transport of satellite-power-system components from low earth orbit to geosynchronous earth orbit, 6:26436 (DOE/CH/10048—1)
Cushman, R.M., *See* Suter, G.W. II, 6:26149
Czanderna, A.W., Basic research needs and opportunities on interfaces in solar materials, 6:25232 (CONF-8006156—)
See Gottschall, R.J., 6:25233

D

D'Aiello, R.V., Low-cost epitaxial techniques for solar-cell fabrication. Final report, 25 September 1979-24 September 1980, 6:25263 (SERI/TR—8274-1-T1)
Daams, J.M., *See* MacDonald, A.H., 6:25921
Dabolt, R.J., Studies and research concerning BNFP design and construction of a spent-fuel disassembly/encapsulation system, 6:25101 (AGNS—47921-2.1-14)
Dahan, G., Technical-economical aspects of mechanical energy production from waste heat by using organic fluids working on Rankine cycles, 6:25768 (CONF-800272—, pp 63-94)
Dahl, J.B., Use of radioactive tracers to study runoff and soil-water intereactions in natural mini-catchments, 6:26183 (CONF-800365—, pp 160-161)
See Christophersen, N., 6:26205
Dale, A.C., Analysis and summary of a solar air collector-groundwater heat storage-greenhouse heating system, 6:25354
Dale, D.A., *See* Parker, N.R., 6:26152
Dalhed, H.E. Jr., *See* Todd, A.M.M., 6:26639
Dallman, J.C., De-entrainment on vertical elements in air droplet cross flow, 6:26042
Daly, A.T., Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)
Daniels, E., *See* Jerger, D.E., 6:25194
Daniels, J.A., *See* Schroeder, R.L., 6:26057
Danielson, H.H., Penn Grade Micellar Displacement Project, 6:25011 (DOE/BETC/IC—80/3(Vol.2), pp 6p, Paper 11)
Danielson, W.F., *See* Niccum, M., 6:25391
Dankowych, J.A., Evidence for neutral A_1 and H resonances in charge exchange, 6:26492
Darby, R., *See* Glover, C.J., 6:24977
Das, G., Quadratically convergent MCSCF theory for large-

configuration sets, 6:26448 (CONF-800726—2)
Das, M.B., Controlled cadmium telluride thin films for solar-cell applications. Third quarterly report, December 1, 1980-February 1, 1981, 6:25260 (SERI/PR—9131-1-T3)
Dauzvardis, P., *See* Habegger, L., 6:25229
David, I., *See* Dominey, D.A., 6:25063
Davids, C.N., *See* Holland, R.E., 6:26577
Davidson, G.T., *See* West, H.I. Jr., 6:26442
Davidson, N.J., *See* Long, P.E., 6:26429
Davidson, V.A., Outer-continental shelf oil and gas leasing policy, 6:25041 (DOE/PE/70278—T14)
Davies, A., *See* Tu, K.M., 6:25720
Davies, J., *See* Koester, L.J., 6:26499
Davis, E.A., Environmental assessment of cooling tower drift and vapor emissions for the proposed Vienna Unit No. 9, 6:25450 (PB—81-119737)
Davis, H.T., New concepts for enhancing petroleum recovery, 6:25025 (DOE/BETC/IC—80/3(Vol.2), pp 5p, Paper 26)
Davis, J.F., *See* Minehart, R.C., 6:26491
Davis, J.G., *See* Ferrell, H.H., 6:25007
Davis, J.P., Industry/DOE diesel cogeneration demonstration program, 6:25767 (CONF-800272—, pp 44-62)
Davis, J.R., *See* Hopkins, R.H., 6:25250
Davis, J.R. Jr., *See* Rohatgi, A., 6:25274
Davis, J.W., *See* Smith, D.L., 6:26680
Davis, M.A., *See* Simmons, J.D., 6:25743
Davis, R., *See* Ammar, R., 6:26504
See Thompson, M.E., 6:26262
Davis, R.B., Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. II. Diatom stratigraphy and inferred pH, 6:26272 (CONF-800365—, pp 270-271)
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. IV. Synthesis, and comparison with New England, 6:26274 (CONF-800365—, pp 274-275)
Davis, W.K., Perspective on alternative electric power sources, 6:25822
Davis, W.R., Determination of the thermal conductivity of refractory insulating materials by the hot-wire method, 6:25686
Davison, S.G., *See* Bockris, J.O'M, 6:25243
Dawson, J.M., *See* Liewer, P.C., 6:26038
Dawson, L.R., *See* Wiczer, J.J., 6:26089
Day, D., *See* Minehart, R.C., 6:26491
Day, R.H., Photoemission measurements for low energy x-ray detector applications, 6:26609 (LA-UR—81-1712)
Daye, P.G., *See* Peterson, R.H., 6:26377
De Facio, B., *See* Hammer, C.L., 6:26478
De Jonghe, L.C., Performance of sodium-beta alumina solid electrolyte in Na/S cells, 6:25588 (LBL—12657)
De Ponte, F., *See* Bertasi, M., 6:25679
de Saussure, G., Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions, 6:26597 (CONF-810606—53)
Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions, 6:26598 (CONF-810606—68)
Dean, A.H., *See* McDonald, J.R., 6:25467
Dean, J.D., *See* Goldstein, R.A., 6:26266
Deans, H.A., Single-well chemical tracer method for measuring residual oil saturation, 6:24992 (DOE/BETC/IC—80/3(Vol.1), pp 21p, Paper 18)
Dearing, J.F., Two-dimensional computational modeling of sodium boiling in simulated LMFBR fuel-pin bundles, 6:25521 (CONF-810606—54)
Dechow, F.J., Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations, 6:25687
DeCorso, S.M., Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
DeFreece, D., *See* Abdou, M.A., 6:26667
DeFreece, D.A., *See* Baker, C.C., 6:26679
DeGasperi, K.D., Illustrator's view of more-effective technical communication through computer graphics, 6:26719 (LA-UR—80-3457)
Degenne, M., Measurement of the thermal resistance of thick low-density mineral fiber insulation, 6:25682
Dehmer, J.L., *See* Swanson, J.R., 6:26458
Dehmer, P.M., Electron spectra and structure of atomic and molecular clusters, 6:26450 (CONF-8004161—1)
Dehne, H., An automatic isokinetic sampler for particulate emissions from aircraft gas turbine engines. Final report Feb 75-Jun 78, 6:25852 (AD-A—090280)
Del Vigna Filho, E., *See* Ettinger, K.V., 6:26084, 6:26085
Delapalme, A., *See* Lander, G.H., 6:25962
DeLaquil, P. III, *See* Fish, J.D., 6:25347
Delasanta, D., *See* Cabraal, R.A., 6:25297
Delgado, S.M., *See* Heckes, A.A., 6:24987
Dellin, T.A., LINSOL: a model for predicting the optical performance of parabolic trough solar thermal systems, 6:25382 (SAND—80-2867C)
Delmas, R.J., Acidity of Antarctic snow: a natural reference level for acid rains, 6:26181 (CONF-800365—, pp 104-105)
DeLollis, N.J., *See* Butler, B.L., 6:25245
DeMandel, R.E., *See* Wada, R.Y., 6:26154
DeMuth, N.S., *See* Dobranich, D., 6:25529
Den Hartog, P.K., *See* Yntema, J.L., 6:26064
Denavit, J., Computer simulation of kinetic properties of plasmas. Progress report, July 1, 1980-May 31, 1981, 6:26632 (DOE/ET/53041—13)
Deng, J.C., *See* Baird, C.D., 6:25359
Denison, A.B., *See* Boekema, C., 6:25950
deNoyelles, F. Jr., In situ continuous culturing of lake phytoplankton communities, 6:26233
DePinto, J.V., Use of microcosms to evaluate acid lake recovery techniques, 6:26236
der Mateosian, E., *See* Kreiner, A.J., 6:26585
Derosiers, R., Gasification engineering. Quarterly report, January-March 1981, 6:25185 (SERI/PR—622-1153)
DeSerio, R., Periodic wavelength dispersion in a scanning UV monochromator, 6:26622
Desjarlais, A.O., *See* Tye, R.P., 6:25721
Desmarais, A.M., *See* Silvestro, E., 6:25040
Devary, J.L., Assessment of effectiveness of geologic isolation systems: geostatistical modeling of pore velocity, 6:25165 (PNL—3789)
DeVer, E.A., *See* Jackson, J.A., 6:25102
Dewan, D., *See* Bos, P., 6:25042
Diamond, R.M., *See* Newton, J.O., 6:26588
Diaz, L., *See* Reed, T.B., 6:25206
Diaz, L.F., *See* Trezek, G.J., 6:25201
Dibert, P.C., *See* Fraleigh, P.C., 6:26227
Dick, D.L., *See* Skogerboe, R.K., 6:24937
Dickens, J.K., Yields of fission products produced by thermal-neutron fission of ^{249}Cf, 6:26600
Dickerson, L.S., *See* Westmoreland, P.R., 6:24890
Dicks, J.B. Jr., *See* Chapman, J.N., 6:25656
Dickson, K.L., *See* Rodgers, J.H. Jr., 6:26238
Dickson, W., Properties of acidified waters, 6:26117 (CONF-800365—, pp 75-83)
Dickson, W.T., *See* Wright, R.F., 6:26285
Dieterle, W.E., *See* Schindler, R.H., 6:26486
DiFulgentiz, R.A., Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant, 6:24848 (DOE/ET/13060—T4)
Digenis, G.A., *See* Jay, M., 6:26008
Dill, D., *See* Swanson, J.R., 6:26458
Dillion, J.B., *See* Schindler, R.H., 6:26486
Dillon, C.R., Thermal effects on primary productivity of phytoplankton, periphyton and macrophytes in Lake Keowee, South Carolina. Report for 1 Jul 72-30 Jun 76, 6:25466 (PB—81-112435)
Dillon, P.J., Some aspects of acidification in southern Ontario, 6:26249 (CONF-800365—, pp 212-213)
Dillon, R.D., Microbiocoenoses in an Antarctic pond, 6:26230
Dimopoulos, S., Technicoloured signatures, 6:26564
Dines, E.L., *See* Newton, J.O., 6:26588
Dinolfo, G.A., Waste flow control and its role in financing resource recovery facilities, 6:26301 (ANL/CNSV-TM—60, pp 455-468)
Dittmore, C.H., Psuedo-3D, isodensity and density profiles from fiber optic output of a MACH-130 air shock, 6:26091 (UCRL—85655)
Ditzler, W.R., *See* Auer, I.P., 6:26489, 6:26490
Divona, C.J., *See* Petty, J.A., 6:25511
Dixon-Davis, D.K., Mortality in 191 counties near energy facilities: use of economic and social variables for standardization, 6:26393
Do, L.N., *See* Fraley, L.D., 6:24967
Dobranich, D., Special small-break applications with TRAC, 6:25529 (LA-UR—81-1519)
Doctor, P.G., *See* Devary, J.L., 6:25165
Dodson, B.W., Exploratory study of reactivity in organic compounds subjected to shock loading, 6:25993 (SAND—81-1386C)
Shock-induced defects in cadmium sulfide, 6:25953 (SAND—81-1354C)
Doe, T., Analysis of constant-head well tests in nonporous fractured rock, 6:26410 (LBL—12076, pp 84-89)
Doe, T.W., Third invitational well-testing symposium: well testing in low

permeability environments, 6:26404 (LBL—12076)
Doggart, J., Passive solar in Milton Keynes, 6:25370
Dohrenwend, B.P., Stress in the community: a report to the President's Commission on the Accident at Three Mile Island, 6:25553
See Chisholm, R.F., 6:25551
Dohrenwend, B.S., *See* Chisholm, R.F., 6:25551
See Dohrenwend, B.P., 6:25553
Dohrenwend, R.E., Acid precipitation in the Keweenaw Peninsula of Michigan's Upper Peninsula, 6:26120 (CONF-800365—, pp 106-107)
Dole, M., *See* Gvozdic, N., 6:26004
Dollard, G.J., Wind tunnel studies of dry deposition of SO_2 and H_2SO_4 aerosols, 6:26121 (CONF-800365—, pp 108-109)
See Horntvedt, R., 6:26351
Dominey, D.A., CEGB experience with additive trials, 6:25063 (EPRI-WS—80-127, pp 2.19-2.36)
Domingo, N., Ammonia condensation experiments at Oak Ridge National Laboratory, 6:25313 (CONF-810622—1)
Donaldson, A.B., Summary of DEEP STEAM downhole steam generator development activities, 6:25035 (SAND—81-0882C)
Donaldson, E.C., Reservoir evaluation and measurement of oil saturation, 6:24979 (DOE/BETC/IC—80/3(Vol.1), pp 7p, Paper 4)
Donaldson, G., *See* Abshire, G., 6:26498
Donaruma, L.G., *See* Martin, F.D., 6:25018
Donnelly, T.W., *See* Van Orden, J.W., 6:26607
Donohoe, A.J., *See* Albright, L.D., 6:25353
Donovan, J.M., *See* Molton, P.M., 6:25284
Donovan, T.M., Preparation and characterization of hydrogenated amorphous silicon. Quarterly progress report No. 7, 1 December-28 February 1981, 6:25258 (SERI/PR—8142-4-T2)
Dooher, C.A., *See* Bianucci, J.A., 6:25074
Dooley, J.E., Characterization of fossil liquids, 6:25056 (DOE/BETC/IC—80/3(Vol.4), pp 17p, Paper 2)
Dooley, R.B., Planning and executing fireside additive testing in Ontario Hydro, 6:24961 (EPRI-WS—80-127, pp 2.37-2.58)
Summary of discussion group sessions on back-end corrosion and acid emissions by oil-fired boilers, 6:25065 (EPRI-WS—80-127, pp 2.65-2.69)
Doran, J.C., Some aspects of fluctuating vertical wind shears, 6:25424 (PNL—3771)
Dorenbosch, J., *See* Schindler, R.H., 6:26486
Dorfan, J., Measurement of the decays tau⁻→rho⁻ ν/sub tau/ and tau⁻→K⁻(892)ν/sub tau/ using the Mark II detector at spear, 6:26506
Dorfan, J.M., *See* Schindler, R.H., 6:26486
Dorn, H.C., Development and application of analytical techniques to chemistry of donor solvent liquefaction. Quarterly progress report, April 1980-June 1980, 6:25968 (DOE/PC/30041—T2)
Dorrence, S.M., *See* Marchant, L.C., 6:25081
Dorward, R.C., Energy savings through the use of an improved aluminum reduction-cell cathode. Technical progress report, April 1, 1980-June 30, 1980, 6:25796 (DOE/CS/40215—T1)
Doughty, D.A., *See* Good, W.D., 6:25057
Dovland, H., Atmospheric transport of pollutants, 6:26115 (CONF-800365—, pp 14-21)
Dowgiallo, E.J. Jr, Baseline tests of the Electra Van Model 1000 electric vehicle. Test report 20 Sep-28 Nov 78, 6:25877 (AD-A—090113)
Drabloes, D., Ecological impact of acid precipitation, 6:26332 (CONF-800365—)
Historical land-use changes related to fish status development in different areas of southern Norway, 6:26201 (CONF-800365—, pp 367-369)
Lake acidification, fish damage, and utilization of outfields. A comparative survey of six highland areas, southeastern Norway, 6:26386 (CONF-800365—, pp 354-355)
Draeger, J.A., *See* Good, W.D., 6:25990
Drake, J.F., Collisional drift waves in a plasma with electron temperature inhomogeneity, 6:26648
Draper, J.E., *See* Newton, J.O., 6:26588
Dravid, N.V., *See* Sato, N., 6:25480
Drexler, J.A. Jr., *See* Greene, M.R., 6:25131
Drickamer, H.G., *See* Salman, O.A., 6:26457
Driemeyer, D., *See* Brooks, J.N., 6:26674
Driscoll, C.T., Aqueous speciation of aluminum in the Adirondack region of New York State, USA, 6:26250 (CONF-800365—, pp 214-215)
Droege, T., *See* Berg, D., 6:26509
DuBois, A.O., *See* Long, J.C.S., 6:26406
Duckett, E.J., Technical and marketing issues affecting the use of RDF as kiln fuel, 6:25204 (ANL/CNSV-TM—60, pp 413-431)
Ducot, E.R., *See* Levis, A.H., 6:25815
Duda, J.L., *See* Klaus, E.E., 6:25021
Duerre, K.H., Pretest and posttest calculations of Semiscale Test S-07-10D with the TRAC computer program, 6:25532 (LA-UR—81-1556)
Dugan, E.T., *See* Tesar, D., 6:25499
Dugan, V.L., Foreign travel report, 6:25323 (CONF-790203—, pp 48p, Paper 1)
Overview of solar system design and application principles, 6:25378 (CONF-790203—, pp 13p, Paper 2)
Duke, B.W. Jr., Incorporating earth shelter considerations into the design process for nonresidential buildings, 6:25741
Duke, C.B., *See* Balluffi, R.W., 6:25242
Duncan, M.G., *See* Carver, D.W., 6:25757
Dunlap, B.D., *See* Chein, C.L., 6:25897
Dunn, D.E., *See* Odom, A.L., 6:26416
Dunn, J.D., *See* Cain, W.S., 6:26400
Dunn, W.E., Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 3. Plume rise from mechanical draft cooling towers. Technical report, 6:25461 (NUREG/CR—1581-V-3)
See Policastro, A.J., 6:25460
Durai-Swamy, K., Controlled flash pyrolysis, 6:24859 (DOE/PC/30264—06)
Duscha, R.A., Industrial thermal-storage applications, 6:25765 (CONF-800272—, pp 17-24)
Duty, R.C., Carbonylation studies with Illinois No. 6 bituminous coal, 6:24920
Duvall, D.S., *See* Hecht, N.L., 6:25843
Dwiggins, C.W., *See* Good, W.D., 6:25057
Dyer, F.F., Determination of uranium and thorium in semiconductor memory materials by high fluence neutron activation analysis, 6:25965 (CONF-810682—3)
Dyer, N.C., *See* Mandler, J.W., 6:25536
Dymbe, L., Modelling sulfate concentrations in streamwater at Storgama, Southern Norway, 6:26278 (CONF-800365—, pp 288-289)

E

Eagle, K.H., *See* Strong, R.E., 6:25441
Eastes, R.W., *See* Wells, J.C., 6:26586
Eastwood, J., Good housekeeping, 6:25675 (CONF-7910214—, pp vp, 30p)
Eaton, M.W., *See* Schindler, R.H., 6:26486
Ebert, G., Study on an example of heat supply from waste heat. Final report, 6:25804 (PB—81-104879)
Echenique, P.M., Semiclassical image potential at a solid surface, 6:26616
Eck, T.F., Solar-energy-system performance evaluation: Dallas Recreation Center, Dallas, Texas. March-November 1980, 6:25352 (SOLAR/2038—81/14)
Ecklund, S., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Ecock, E.J., Retard back-end corrosion and acid emissions in oil-fired boilers, 6:25446 (EPRI-WS—80-127, pp 2.9-2.18)
Economou, N.A., *See* Papadimitriou, L., 6:25272
Edelstein, R.H., *See* Cassel, T.A.V., 6:25393
Edgerton, E.S., *See* Hendry, C.D., 6:26125
Edman, G., River Hoegvadsan liming project: a presentation, 6:26365 (CONF-800365—, pp 300-301)
Edwards, D., *See* Barish, B., 6:26517
Edwards, K.W., *See* Dankowych, J.A., 6:26492
See Yager, P.M., 6:26487
Edzwald, J.K., *See* DePinto, J.V., 6:26236
Efremenko, V., *See* Ammar, R., 6:26504
Egger, H., Tunable, ultrahigh-spectral-brightness ArF* excimer laser source, 6:26037
Egorov, O., *See* Ammar, R., 6:26504
Ehlers, K.W., *See* Berkner, K.H., 6:26454
See Vaucher, B.G., 6:26470
Ehrman, L., *See* Wheaton, F.W., 6:25818
Ehst, D.A., Lower-hybrid heating and current drive system for the STARFIRE tokamak, 6:26628 (CONF-801011—97)
See Baker, C.C., 6:26678
Eisenreich, S.J., Impact of land-use on the chemical composition of rain and snow in northern Minnesota, 6:26182 (CONF-800365—, pp 110-111)

Eklund, S., Swedish heat pump projects 1979: research, development, full-scale experiments, 6:25725 (PB—81-114530)
El-Sayed, Y.M., *See* Tribus, M., 6:25799
Elder,F.C., *See* Thompson, M.E., 6:26262
Elek, L.F., *See* Rabo, J.A., 6:25182
Elfenbein, G.J., Cytogenetic evidence for recurrence of acute myelogenous leukemia after allogeneic bone marrow transplantation in donor hematopoietic cells, 6:26312
Ellingson, A.C., *See* Trauth, C.A. Jr., 6:25607
Elliott, E.T., Microbial trophic structure and habitable pore space in soil, 6:26180
Elliott, R.C., *See* Yao, N.P., 6:25584
Ellison, J.E., *See* Hunger, H.F., 6:25581
Ellsaesser, H.W., *See* Potter, G.L., 6:26108
See Viecelli, J.A., 6:26289
Elmgren, R., Trophic interactions in experimental marine ecosystems perturbed by oil, 6:26396
Elmore, M.R., *See* Hartley, J.N., 6:25133
Elston, L.W., *See* Knight, J.A., 6:25184
Elwyn, A.J., *See* Holland, R.E., 6:26577
Emery, A.F., Earth sheltered passive solar structures: occupant comfort and energy use, 6:25365
Emery, J.F., *See* Dyer, F.F., 6:25965
Enge, H.A., Half-lives of ^{199}Rn and ^{199}Rn/sup m/, 6:26593
Engelder, T., *See* Scholz, C., 6:26425
Engelder, T.J., *See* Odom, A.L., 6:26416
Engler, E.M., *See* Kwak, J.F., 6:25959
English, R.A., Development of a high temperature solar powered water chiller. Volume I. Phase II: technical progress report, June 1, 1978-March 31, 1979, 6:25335 (DOE/CS/31590—)
Entine, G., *See* Squillante, M.R., 6:25257
Epstein, K.A., *See* Dechow, F.J., 6:25687
Erdman, D.C., Ultrasonic extensometry for determining bolt preload in heavy industry: from petrochemical to reactors, 6:26028
Ergun, S., *See* Schiefelbein, G.F., 6:25290
Erickson, D.C., Air separation by the Moltox process. Interim final report, 6:25797 (DOE/CS/40287—T1)
Erickson, D.J., *See* Fowler, C.M., 6:26635
Erskine, J., *See* Smith, R.P., 6:26067
Ertekin, T., *See* Klaus, E.E., 6:25021
Eschenbaum, R.A., Hot-cell verification facility, 6:25512 (HEDL-SA—2316-FP)
Essenhigh, R.H., *See* Scaroni, A.W., 6:24886
Esterl, D.J., *See* Hartley, J.N., 6:25133
Ettinger, K.V., Applications of lyoluminescence, 6:26085
Lyoluminescent dosimetric materials and their response to ionizing radiation, 6:26084
Evans, D.M., *See* Watts, R.J., 6:25036
Evans, J.W., *See* Chan, C., 6:26461
Evans, K. Jr., Starfire poloidal coil systems, 6:26671 (CONF-801011—86)
See Baker, C.C., 6:26678
See Ehst, D.A., 6:26628
See Turner, L.R., 6:26676
Evans, L.S., Effects of simulated acidic rainfalls on yields of field-grown radishes and garden beets, 6:26331 (BNL—29433)
Evans, R.D., Characterization of fluid flow in naturally fractured reservoirs, 6:24990 (DOE/BETC/IC—80/3(Vol.1), pp 4p, Paper 16)
Evenson, R.J., Electrical and electronic subsystems of a nuclear waste tank annulus inspection system, 6:25141 (RHO-SA—221)
Everett, R., *See* Doggart, J., 6:25370
Eyring, E.M., *See* Riseman, S.M., 6:25960

F

Faas, S.E., *See* Fish, J.D., 6:25347
Fabijanowski, J., Reconstruction of species composition of stands as a necessary condition for the survival of the Niepolomice Forest, 6:26344 (CONF-800365—, pp 164-165)
Fabuss, B.M., *See* Schroeder, R.L., 6:26057
Fackler, O., *See* Barish, B., 6:26517
Fagaly, R.L., *See* Tsai, C.L., 6:25922
Fahy, L.J., Steam injection test in the Northwest Asphalt Ridge tar sand deposit near Vernal, Utah, 6:25082 (DOE/BETC/IC—80/3(Vol.1), pp 4p, Paper 30)
Fairchild, R.G., *See* Ettinger, K.V., 6:26084
Fajardo, L.A., Real part of the forward elastic nuclear amplitude for pp, p-barp, π^+p, π^-p, K^+p, and K^-p scattering between 70 and 200 GeV/c, 6:26485
See Schiz, A., 6:26484
Falco, C.M., *See* Cashion, J.D., 6:25896
Fan, C.W., *See* Markuszewski, R., 6:24866
Fanslow, G.E., *See* Bluhm, D.D., 6:24948
Farber, G., Mechanochemical hydrogenation of coal, 6:24865
Farber, P.S., *See* Livengood, C.D., 6:25638
Farnum, B.W., *See* Olson, E.S., 6:24912
Farooque, M., Evaluation of distributed gas cooling of pressurized PAFC for utility power generation. Second quarterly report, December 1980-February 1981, 6:25667 (DOE/NASA/0201—2)
Farrar, J.M., *See* Bilotta, R.M., 6:26006
Farrell, E.P., Effects of artificial acidification with sulfuric acid on soil chemistry in a Scots pine forest, 6:26186 (CONF-800365—, pp 186-187)
Farwell, D.E., *See* Kieffer, J., 6:26728
Feagin, J.R., Urban revitalization and displacement: types, causes, and public policy, 6:25728 (UT/CES-PS—16)
Feigelson, R.S., *See* Byer, R.L., 6:26036
Feinberg, B., Anomalous toroidal field penetration in Tormac V, 6:26658
Feinberg, G., Coldest neutron star, 6:26434
Feldkirchner, H.L., Hydrogasification of oil shale. Final report Jan 72-Dec 79, 6:25085 (PB—81-114092)
Feldman, G.J., *See* Schindler, R.H., 6:26486
Feldman, H.F., Conversion of forest residues to a clean gas for fuel or synthesis., 6:25190
Feldmann, H.F., Thermochemical gasification of woody biomass, 6:25186
Fenimore, E.E., Uniformly redundant arrays: digital reconstruction methods, 6:26623
Ferbel, T., *See* Berg, D., 6:26509
Ferrell, H.H., Big Muddy low-tension flood process demonstration project, 6:25007 (DOE/BETC/IC—80/3(Vol.2), pp 7p, Paper 7)
Ferren, L.A., *See* Knapp, F.F., 6:26311
Ferrer, S., Evidence for photodissociation of water vapor on reduced $SrTiO_3$ (111) surfaces in a high vacuum environment, 6:26000
Fertl, W.H., *See* Rieke, H.H. III, 6:25070
Finalle, L.L., *See* Danielson, H.H., 6:25011
Fine, H.A., Analysis of the applicability of the hot-wire technique for determination of the thermal conductivity of diathermanous materials, 6:25683
Finn, P.A., Tritium-handling considerations for ETF and STARFIRE, 6:26673 (CONF-801011—88)
Fischer, T.A., 16-μm laser oscillation in propyne, 6:26035
Fischler, S., *See* Tu, K.M., 6:25720
Fish, J.D., Central receiver steam systems for industrial process heat applications, 6:25347 (SAND—81-8223)
Fisher, R.W., Nonconsumable arc melting furnace, 6:26024 (SAND—81-0810)
Fisher, T.F., *See* Masuda, T., 6:25188
Fisk, E., *See* Barish, B., 6:26517
Fitzner, R.E., Raptors of the Hanford Site and nearby areas of southcentral Washington, 6:26177 (PNL—3212)
Fjeld, S., OTEC Pilot Plant: requirements to design fabrication inspection, maintenance and repair of Hull, CWP and SKSS, 6:25253 (DOE/NOAA/OTEC—38)
Flanagan, C.A., Initial trade and design studies for the fusion engineering device, 6:26700 (ORNL/TM—7777)
Fleischer, S., *See* Edman, G., 6:26365
See Gahnstroem, G., 6:26279
Fleissner, J.G., GRPAUT: a computer code for automated isotopic analysis of plutonium spectra, 6:26722 (MLM—2841(OP))
Fletcher, G.E., *See* Collins, A.G., 6:24976
Flores, J., *See* Brody, T.A., 6:26606
Flory, C.A., Topics in the theory of heavy-quark systems, 6:26520 (LBL—12558)
Flumerfelt, R.W., Dynamic interfacial properties and their effects on oil ganglia reconnection and displacement processes, 6:25024 (DOE/BETC/IC—80/3(Vol.2), pp 8p, Paper 25)
Flynn, C.B., Local public opinion, 6:25552
Flynn, E.R., Spectroscopy and mass measurements of neutron rich isotopes by the (t,α) reaction, 6:26590 (LA-UR—81-1721)
See Cizewski, J.A., 6:26594
See Wilhelmy, J.B., 6:26589
Flynn, J.B., *See* Nelson, R.G., 6:25601
Flynn, L., Inspection, maintenance and repair of motor vehicles. Subject bibliography, 6:25868 (PB—81-109761)
Foley, R.T., Definition of chemical and electrochemical properties of a fuel cell electrolyte. Final technical report 25 Mar 77-24 Jun 80, 6:25661 (AD-A—089776)
Follstaedt, D.M., Pulsed laser irradiation of Al, 6:25928

Folsom, B.A., *See* Nelson, L.P., 6:25795
Forbes, T.G., Substorm-related plasma sheet motions as determined from differential timing of plasma changes at the Isee satellites, 6:26439
See Sckopke, N., 6:26441
Ford, D.L., *See* Harrison, W., 6:24925
Ford, W.T., Use of similarity methods in evaluation of reservoir simulators, 6:24989 (DOE/BETC/IC—80/3(Vol.1), pp 14p, Paper 15)
Forste, D.S., *See* Gibbs, L.L., 6:26061
Forster, C.B., Injection versus pressure pulse borehole tests in fractured crystalline rocks: observations and recent experiences, 6:26409 (LBL—12076, pp 74-83)
Fort, T. Jr., *See* Benton, W.J., 6:25053
Foss, G., *See* Fjeld, S., 6:25253
Foster-Pegg, R.W., Exhaust-fired fluid-bed combined cycle for power generation: preliminary feasibility study. Final report, 6:25442 (EPRI-CS—1818)
Fowkes, F.M., *See* Butler, B.L., 6:25245
Fowler, C.M., Pulse power applications of flux compression generators, 6:26635 (LA-UR—81-1601)
See Hawke, R.S., 6:26026
Fowler, D., Influence of a polluted atmosphere on cuticle degradation in Scots pine (Pinus sylvestris), 6:26341 (CONF-800365—, pp 146)
Removal of sulphur and nitrogen compounds from the atmosphere in rain and by dry deposition, 6:26116 (CONF-800365—, pp 22-32)
See Nicholson, I.A., 6:26136, 6:26137, 6:26138
Fox, B.L., *See* Hecht, N.L., 6:25843
Fox, R.J., Measurement of peak temperature along an optical fiber, 6:26087 (DOE/TIC—1023186)
Fox, R.L., *See* Donaldson, A.B., 6:25035
Fradin, F.Y., *See* Stafford, B.L., 6:25945
Fradkin, L., Enhancement of methane gas production using an industrial waste in anaerobic digestion, 6:25179 (CONF-801210—26)
Fraleigh, P.C., Inorganic carbon limitation during ecological succession in aquatic microcosms, 6:26227
Fraley, L.D., Circulating fluidized bed boiler, 6:24967
Frame, E.A., Engine tests using high-sulfur diesel fuel. Final report, 6:25851 (AD-A—090142)
France, S.W., *See* Nixon, K.V., 6:26078
Francis, W.R., *See* Yager, P.M., 6:26487
Franke, P.R., Hot dry rock geothermal energy development program. A progress report, 6:25400 (LA-UR—81-1265)
Frankenfeld, J.W., Fundamental synthetic fuel stability study, 6:24901 (DOE/BETC/IC—80/3(Vol.4), pp 11p, Paper 11)
Franklin, H.D., Effects of calcium minerals on the rapid pyrolysis of a bituminous coal, 6:24879
Franklin, M.E.B., *See* Schindler, R.H., 6:26486
Franz, J.A., Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 6:24875
Franzin, W.G., Fallout, distribution and some effects of Zn, Cd, Pb, Cu and As in aquatic ecosystems near a base metal smelter on Canada's Precambrian Shield, 6:26366 (CONF-800365—, pp 302-303)
Fraser, M.D., Energy plantation and the photosynthesis energy factory, 6:25285
Freas, W.P., *See* Gipson, G.L., 6:26173
Fredrick, T.J., Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides, 6:24877
Freedman, M.L., *See* Schindler, J.E., 6:26219
See Waide, J.B., 6:26220
Freeman, B.L., *See* Fowler, C.M., 6:26635
Freeman, D.L., Techniques for assessing the wind energy resource in the North Central region, 6:25414 (PNL—3667)
Techniques for assessing the wind energy resource in the Southern Rocky Mountain region, 6:25417 (PNL—3671)
Freeman, H.D., *See* Hartley, J.N., 6:25133
Freeman, J.R., Plasma channels for intense ion beam transport: theory, 6:26707 (SAND—81-0477C)
Freeman, V.T., *See* Davis, E.A., 6:25450
Freidberg, J.P., *See* Cayton, T.E., 6:26651
Freihaut, J.D., Investigation of yields and characteristics of tars released during the thermal decomposition of coal, 6:24880
French, J.B., *See* Brody, T.A., 6:26606
French, T.R., *See* Collins, A.G., 6:24976
Frese, K.W. Jr., Investigation of photoelectrochemical corrosion of semiconductors. Final report, 15 April 1980-15 April 1981, 6:25954 (SERI/TR—8002-6-T1)
Frey, B.C., Energy aspects and potential energy savings of the new DASI process for milk sterilization, 6:25813
Friberg, F., Effects of acidification on the dynamics of allochthonous leaf material and benthic invertebrate communities in running waters, 6:26367 (CONF-800365—, pp 304-305)
Frisardi, T., *See* Pierson, E.S., 6:25648
Fritz, E.S., Cooling water intake screening devices used to reduce entrainment and impingement. Topical briefs: fish and wildlife resources and electric power generation, No. 9, 6:25468 (PB—81-116055)
Fritz, J.J., Wood gasification: an old technology with new potential for the eighties, 6:25292
Fritz, J.S., *See* Gjerde, D.T., 6:25977
Frost, A.C., *See* Rabo, J.A., 6:25182
Frost, C.A., *See* Woodworth, J.R., 6:26709
Fu, C.Y., *See* Hetrick, D.M., 6:26581
Fucinari, C.A., Ceramic regenerator systems development program. Final report, 6:25862 (DOE/NASA/0008—12)
Fugelli, K., Physiological responses to acid water in fish. 1. Effects from changes in plasma osmolality and ion concentration on heart ventricle water content and intracellular concentrations of K^+ and taurine in the brown trout (Salmo trutta L.), 6:26383 (CONF-800365—, pp 346-347)
Fuja, R., *See* Ehst, D.A., 6:26628
Fujii, T., Integrated system for solid waste disposal with energy recovery and volumetric reduction by a new pyrolysis furnace, 6:25189
Fukushima, Y., *See* Barish, B., 6:26517
Fuller, E.J., *See* Hazell, W.J., 6:26054
Fuller, E.L. Jr., Physicochemical characterizations of limestone for fluidized-bed coal combustion, 6:24964 (ORNL/TM—7292)
Fuller, S.L.H., *See* Britton, J.C., 6:26211
Furmanska, B., *See* Ammar, R., 6:26504
Furtak, T.E., Critical analysis of theoretical models for the giant Raman effect from adsorbed molecules, 6:26473
See Bockris, J.O'M, 6:25243

G

Gaczi, P.J., ESR in CVD silicon and silicon-carbon alloys, 6:25961
Gaeke, M.E., Human T-cell lymphoma with suppressor effects on the mixed lymphocyte reaction (MLR). I. Morphological and cytogenetic analysis, 6:26305
Gagne, G., Baseline fuel economy and emissions tests of a Chrysler 1978, 225 CID engine. Final report, 6:25866 (PB—81-105819)
Gahnstroem, G., Decomposition and exchange processes in acidified lake sediment, 6:26279 (CONF-800365—, pp 306-307)
Gaillard, M.K., CP violation at high energies, 6:26563
Gaines, L.L., Energy and materials flows in petroleum refining, 6:25038 (ANL/CNSV—10)
Gale, J.E., *See* Forster, C.B., 6:26409
Gall, B.L., Semi-automated method for determining cation exchange capacity of clays in sedimentary rocks, 6:24998 (DOE/BETC/IC—80/3(Vol.1), pp 11p, Paper 27)
Gallagher, A., Diagnostics of a glow discharge used to produce hydrogenated amorphous silicon films. Final report, February 15, 1980-April 14, 1981, 6:25264 (SERI/TR—9053-1-T3)
Galloway, J.N., Analysis of lake acidification using annual budgets, 6:26267 (CONF-800365—, pp 254-255)
Sources of acidity in three lakes acidified during snowmelt, 6:26270 (CONF-800365—, pp 264-265)
See Johannes, A.H., 6:26190
Galvin, W.E., *See* Gardner, J.F., 6:24855
Gammage, R.B., Luminescence monitoring of oil or tar contamination for industrial hygiene, 6:26095
See Vo-Dinh, T., 6:26094
Gammon, B.E., *See* Good, W.D., 6:24899, 6:25058, 6:25990
Gandsman, J., *See* Dankowych, J.A., 6:26492
Ganezer, K.S., *See* Zarbakhsh, F., 6:26488
Gapienko, V., *See* Ammar, R., 6:26504
Gaponov, V.A., *See* Vekshtein, G.E., 6:26663
Garabedian, P., *See* Bauer, F., 6:26666
Garcia, A. III, Quantitative method for photovoltaic encapsulation system optimization, 6:25278
Garcia, C., *See* Nixon, K.V., 6:26078

Garcia, R., *See* Mick, C., 6:25327
Gardner, J.A., *See* Willoughby, J.K., 6:24988
Gardner, J.F., Anchor/Darling Double-Disc Gate Valve, METC SOA Test Valve No. A-12 and Test Valve No. A-12R state-of-the-art Lockhopper Valve-Testing and Development Project. Summary test report, 6:24855 (DOE/MC—169)
W-K-M Dyna-Seal Ball Valve METC SOA Test Valve No. A-7, state-of-the-art lockhopper valve-testing and development project. Summary test report, 6:24854 (DOE/MC—159)
Garner, D.C., Simulation of fluid thermal fluctuations in the CRBRP steam generator using model testing, 6:25490 (CONF-810804—4)
Gartling, D.K., *See* Hickox, C.E., 6:26043
Garvey, L., *See* Stapfer, G., 6:25657
Gasper, W., *See* Habegger, L., 6:25229
Gauler, A.L., *See* Rhorer, R.L., 6:26021
Gavin, P.M., *See* Dunn, W.E., 6:25461
Gay, N., *See* Walker, J.N., 6:25805
Gay, T.J., *See* Berry, H.G., 6:26449
Gayheart, T.R., *See* Gardner, J.F., 6:24854, 6:24855
Gears, G.E., Investigations of reported plant and animal health effects in the Three Mile Island area. Regulatory report, 6:25533 (NUREG—0738)
Gehr, J.A., *See* Watts, R.J., 6:25036
Geiger, R.A., *See* Giesy, J.P., 6:26293
Geiser, P.A., *See* Odom, A.L., 6:26416
Gelbard, E., *See* Turner, L.R., 6:26676
Gelbke, C.K., *See* Awes, T.C., 6:26599
Genens, L., *See* Smith, R.P., 6:26067
See Wang, S.T., 6:25647
Genge, M., *See* Bridges, J., 6:25083
Genoni, J., *See* Yano, H., 6:26725
Genoni, T.C., Limiting currents in shielded source configurations, 6:26065
Gerard, V.A., *See* North, W.J., 6:25283
Gerber, E.W., Secure automated fabrication: remote fabrication of breeder-reactor fuel, 6:25099 (HEDL-SA—2332-FP)
Germer, J.H., Application of a Self-Actuating Shutdown System (SASS) to a Gas-Cooled Fast Reactor (GCFR), 6:25504 (DOE/SF/01435—T1)
Gerusky, T.M., Three Mile Island: assessment of radiation exposures and environmental contamination, 6:25505
Ghazee, A.A., *See* Hecht, N.L., 6:25843
Gherini, S., *See* Summers, K., 6:25395
Gherini, S.A., *See* Goldstein, R.A., 6:26266
Ghiglia, D.C., Application of reparameterized Fourier descriptors of e-beam target boundaries, 6:26712 (SAND—81-1524C)
Ghosh, S., Alleviation of environmental problems of waste disposal with production of energy and carbon dioxide, 6:25820
Stabilization and gasification of soft-drink manufacturing waste by conventional and two-phase anaerobic digestion, 6:25819
Gibbs, A.G., Analytical models for simultaneous heat and moisture transport in soils, 6:25140 (RHO-LD—49)
Gibbs, A.J., *See* Hammond, R.B., 6:26696
Gibbs, L.L., Capital and operating costs for industrial boilers. Final report Apr-Jun 79, 6:26061 (PB—81-105934)
Gibert, R.J., *See* Blevins, R.D., 6:26020
Gidal, G., *See* Schindler, R.H., 6:26486
Giddings, J.M., Types of aquatic microcosms and their research applications, 6:26222
Giesy, J.P., Relative mobilization of zinc, cerium, and americium from sediment in an aquatic microcosm, 6:26293
See Bowling, J.W., 6:26221
Giesy, J.P. Jr., Microcosms in ecological research, 6:26212
Gilai, D., Experimental and calculational results of an irradiation experiment in EBR-II, 6:25507 (CONF-810606—55)
Gilbert, J.S., Comparisons of TRAC-PD2 calculations with Semiscale Mod-3 small-break tests, 6:25530 (LA-UR—81-1520)
Giles, Jr., *See* Smith, D.D., 6:26196
Gillen, K.T., *See* Bonzon, L.L., 6:25534
Gillen, M., Long-term creep of Hanford concrete at 250°F and 350°F. Final report, 6:25138 (RHO-C—50)
Gillespie, L.K., Electrochemical deburring, 6:26014 (BDX—613-2594)
Training manual for precision hand deburring, Part 4, 6:26013 (BDX—613-2582)
Gillett, J.W., Chemical evaluation: projected application of terrestrial microcosm technology, 6:26179
Gilley, J.R., *See* Lansford, R.R., 6:25430
Gilliland, M.W., Net energy of seven small-scale hydroelectric power plants, 6:25214 (ORNL/TM—7694)
Ginevan, M.E., Poisson trials approach to interpopulation comparisons of cause of death data, 6:26732
Giovanni, D., *See* Altman, R.F., 6:25456
Gipson, G.L., Guideline for use of city-specific EKMA in preparing ozone SIPS. Draft report, 6:26173 (PB—81-118739)
Giraudi, R.V., Low-cost-silicon-process development. Phase IV: process improvement. Second quarterly technical progress report, 6:25259 (SERI/PR—8279-1-T2)
Gjedrem, T., Genetic variation in acid tolerance in brown trout, 6:26368 (CONF-800365—, pp 308)
Growth and survival of fingerlings in acidic water, 6:26369 (CONF-800365—, pp 309)
Gjerde, D.T., Anion chromatography with low-conductivity eluents. II, 6:25977
Gjoes, N., *See* Alfheim, I., 6:26118
Gladney, E.S., Elemental concentrations in the United States Geological Survey's geochemical exploration reference samples: a review, 6:26432
Glagola, B.G., *See* Awes, T.C., 6:26599
Glass, G., *See* Bhatia, T.S., 6:26576
Glass, G.E., Susceptibility of aquatic and terrestrial resources of Minnesota, Wisconsin, and Michigan to impacts from acid precipitation: informational requirements, 6:26122 (CONF-800365—, pp 112-113)
Glass, N.R., Sensitivity of the United States environment to acid precipitation, 6:26123 (CONF-800365—, pp 114-115)
Glassey, C.R., Forecasts of nuclear power and nuclear fuel requirements, 6:25612
Glenn, H.D., *See* Dittmore, C.H., 6:26091
Glinsman, G.R., *See* Kleinschmidt, R.F., 6:25012
Glover, C.J., Electrochemical analysis of surfactants for enhanced oil recovery, 6:24977 (DOE/BETC/IC—80/3(Vol.1), pp 11p, Paper 2)
Godbey, L.C., *See* Simmons, J.D., 6:25743
Godden, D., *See* Lurmann, F., 6:26157
Goettle, R.J. IV, Energy/economic model analysis. Macroeconomic impacts of research and development in gas supply and end use technologies. Final report, 6:25066 (PB—81-114258)
Goetzinger, J.W., *See* Brinkman, D.W., 6:25043
See Sutterfield, F.D., 6:24900
Gogadze, G.A., Effect of structural fluctuations on depth of penetration of longitudinal electric field into a superconducting film, 6:26619
Gohar, Y., Neutronic optimization of solid breeder blankets for STARFIRE design, 6:26682 (CONF-801011—98)
Goland, A.N., *See* Jean, Y.C., 6:25925
Golbeck, J., *See* Radmer, R., 6:26308
Golbitz, W.C., Time dependent Navier-Stokes solution of a turbulent gas jet ejected from a rectangular orifice into a high-subsonic crossflow. Doctoral thesis, 6:26031 (AD-A—090343)
Golchert, N.W., *See* Sedlet, J., 6:26292
Goldberg, I.B., *See* Heredy, L.A., 6:24876
Goldberger, J., *See* Abshire, G., 6:26498
Goldburg, A., Micellar-polymer oil recovery demonstration in the Bell Creek Field, Montana, 6:25009 (DOE/BETC/IC—80/3(Vol.2), pp 13p, Paper 9)
Selection of reservoirs amenable to micellar flooding, 6:24983 (DOE/BETC/IC—80/3(Vol.1), pp 4p, Paper 8)
Golden, J., Catalytic activity of shock-loaded TiO_2 powder, 6:25984 (SAND—81-1352C)
Goldhaber, G., *See* Schindler, R.H., 6:26486
Goldman, C.R., *See* Neame, P.A., 6:26223
Goldman, T., How large are the neutrino mixing angles?, 6:26526
Goldsteen, K., *See* Chisholm, R.F., 6:25551
See Dohrenwend, B.P., 6:25553
Goldsteen, R.L., *See* Chisholm, R.F., 6:25551
See Dohrenwend, B.P., 6:25553
Goldstein, R.A., Framework for the integrated lake-watershed acidification study, 6:26266 (CONF-800365—, pp 252-253)
Goldstein, S.A., Electron and ion flows in diodes. Final report 19 Mar 79-18 Jun 80, 6:26444 (AD-A—089736)
Goldston, R.J., Confinement of high energy trapped particles in tokamaks, 6:26641 (PPPL—1789)
Golec, T., Support services for the automotive-gas-turbine project, 6:25863 (DOE/NASA/0144—81/1)
Gollin, G.D., *See* Clark, A.R., 6:26500
Gollon, P.J., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Golshani, A., *See* Chen, F.C., 6:25314
Goncalves, A.M., *See* Santos, F.D., 6:26582
Gonczy, J., *See* Wang, S.T., 6:25647
Gooch, J.P., *See* Altman, R.F., 6:25456

Good, W.D., Micellar properties of oil and additives, 6:25057 (DOE/BETC/IC—80/3(Vol.4), pp 3p, Paper 3)
Thermodynamic characterization of condensed-ring compounds, 6:25990 (DOE/BETC/IC—80/3(Vol.4), pp 2p, Paper 6)
Thermodynamic properties of tertiary recovery systems, 6:25059 (DOE/BETC/IC—80/3(Vol.4), pp 5p, Paper 7)
Thermodynamic studies on coal conversion processes, 6:24899 (DOE/BETC/IC—80/3(Vol.4), pp 4p, Paper 4)
Thermodynamics of organic compounds, 6:25058 (DOE/BETC/IC—80/3(Vol.4), pp 4p, Paper 5)
Goodman, G.L., *See* Berkowitz, J., 6:26447, 6:26467
See Childs, W.J., 6:26456
Goodman, L.S., *See* Childs, W.J., 6:26456
Goodman, R.E., *See* Ratigan, J.L., 6:24934
Gordon, A., Rooftop plantings for earth covered buildings in temperate climates, 6:25736
Gordon, H., *See* Abshire, G., 6:26498
Gordon, J.J., *See* Fritz, J.J., 6:25292
Gorenstein, M.V., Large-angular-scale anisotropy in the cosmic background radiation, 6:26433
Gorham, E., *See* Eisenreich, S.J., 6:26182
Goritchev, P., *See* Ammar, R., 6:26504
Gormley, D., Good housekeeping at Vauxhall Motors Limited Luton, 6:25791 (CONF-7910214—, pp vp, 12p)
Gottschalk, A., *See* Zoghbi, S.S., 6:26306
Gottschalk, T., Jet expectations for near future facilities, 6:26555
See Berger, E.I., 6:26533
Gottschall, R.J., Executive summary, 6:25233 (CONF-8006156—, pp 1-8)
See Czanderna, A.W., 6:25232
Gould, W.D., *See* Elliott, E.T., 6:26180
Goulding, F.S., *See* Walton, J.T., 6:26079
Goyal, A., *See* Leppin, D., 6:24888
Graciaa, A., *See* Scamehorn, J.F., 6:25030
Graczyk, D.G., *See* Johnson, S.A., 6:26111
Grady, D.E., Fragment-size prediction in dynamic fragmentation, 6:25911 (SAND—80-2800C)
See Burns, T.J., 6:25914
See Hayes, D.B., 6:25915
Gragg, F.W., *See* Sutterfield, F.D., 6:24900
Graham, R.A., Electrical-to-chemical connection, 6:25992 (SAND—81-1350C)
See Gerber, E.W., 6:25099
See Golden, J., 6:25984
See Morosin, B., 6:25952, 6:25985
See Venturini, E.L., 6:25937
Graham, W.G., *See* Berkner, K.H., 6:26454
Grahn, D., *See* Dixon-Davis, D.K., 6:26393
Grahn, O., Fishkills in two moderately acid lakes due to high aluminum concentration, 6:26370 (CONF-800365—, pp 310-311)
Grammel, S.J., *See* Pierson, E.S., 6:25646, 6:25648
Grannemann, K.L., *See* Wrenn, W.B., 6:26330
Grannis, P., *See* Abshire, G., 6:26498
Granoff, B., *See* Thomas, M.G., 6:24882
Grant, P.M., *See* Barnes, J.W., 6:26007
Grant, W.B., *See* Morrison, E.L., 6:25295
Grassle, J.F., *See* Elmgren, R., 6:26396
Grassle, J.P., *See* Elmgren, R., 6:26396
Graumann, D., *See* Abdou, M.A., 6:26667, 6:26672
See Baker, C.C., 6:26679
Gray, K.E., *See* Bancel, P.A., 6:26618
See Kampwirth, R.T., 6:26017
Gray, M., Effects of a volatile fireside manganese additive on coal-fired utility boiler operation, 6:24962 (EPRI-WS—80-127, pp 3.1-3.15)
Gray, W.H., *See* Baudry, T.V., 6:26022
Grebowsky, J.M., *See* Curtis, S.A., 6:26436
Green, A.K., *See* Rehn, V., 6:25983
Green, B.H., Design innovations for a new minerals engineering building, 6:25740
Green, D.A., *See* Nichols, D.G., 6:24940
Green, H.J., Measured performance of falling-jet flash evaporators, 6:25320 (SERI/TP—631-1270)
Green, H.P., Lessons of Three Mile Island for the institutional management and regulation of nuclear power, 6:25565
Green, M.A., *See* Singh, R., 6:25267
Green, N.J., *See* Bullin, J.A., 6:26159
Green, T.A., *See* Woodworth, J.R., 6:26709
Greene, M.R., Nuclear waste management and environmental mediation: an exploratory analysis. Topical report, 6:25131 (PNL—3678)
Greene, R.L., *See* Kwak, J.F., 6:25959
Greene, S.J., *See* Morris, C.L., 6:26579
Greer, R.T., *See* Markuszewski, R., 6:24866
Gregg, D.W., Apparatus for solar coal gasification, 6:24889
Gregg, M.L., *See* Campbell, J.H., 6:25087
Gregorian, R.S., Wet processing of textiles using foams, 6:25771 (CONF-800272—, pp 119-142)
Greig, J.K., *See* Spillman, C.K., 6:25811
Greiner, W., *See* Reinhardt, J., 6:26466
Grennfelt, P., *See* Bengtson, C., 6:26342
Griest, W.H., Repository support of synfuels health effects research, 6:26388 (CONF-810562—1)
Griffin, G.D., Aryl hydrocarbon monooxygenase activity in human lymphocytes, 6:26389 (ORNL/TM—7721)
Griffin, R.A., Chemical and biological characterization of leachates from coal solid wastes. Final report Sep 76-Jun 79, 6:24930 (PB—81-114043)
Griffith, R.A., *See* Gardner, J.F., 6:24854, 6:24855
Griffiths, P.R., Investigations of the changes of coal structure occurring during gasification. Progress report, 6:24904 (DOE/PC/30210—T1)
Griggs, K.S., *See* Toy, A.J., 6:26200
Grigsby, R.A., *See* Knapp, F.F., 6:26311
Grimaldi, M.G., Epitaxial regrowth of thin amorphous GaAs layers, 6:25956
Grimm, R.C., *See* Todd, A.M.M., 6:26639
Grisak, G.E., Solute tracer tests in fractured media, 6:26411 (LBL—12076, pp 90-93)
Grisham, L.R., Possible non-hydrogen neutralizers for high energy D^+ and H^+ beams, 6:26704 (PPPL—1803)
Grivet, C.D., Modeling and analysis of air-quality data. Technical report No. 43, 6:26144 (DOE/EV/10428—8)
Grizzle, P.L., *See* Brand, S.W., 6:25055
See Dooley, J.E., 6:25056
Groenewold, G.H., Potential effects on groundwater of fly ash and FGD waste disposal in lignite surface mine pits in North Dakota, 6:24927 (EPA/600/9—81-019B, pp 657-693)
Grogan, D.M., *See* Joseph, J.W., 6:25197
Grogan, P.J., *See* Streets, D.G., 6:25604
Grondzik, W.T., Oklahoma earth shelters: a state-of-the-art review, 6:25697 (CONF-800438—, pp 43-54)
See Bice, T.N., 6:25696
See Boyer, L.L., 6:25739
See Weber, M.J., 6:25744
Gronseth, M., *See* Voegele, M., 6:26407
Grove, D.B., Modeling contaminant transport in porous media in relation to nuclear-waste disposal: a review, 6:25110 (CONF-801217—, pp 43-63)
Grove, S., *See* Maw, R., 6:25371
Grube, R.M., Utility view of DOE's enrichment policies, 6:25098
Grula, M.M., Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1), pp 11p, Paper 21)
Guendiler, I., *See* Homhual, C., 6:25384
Guerin, M.R., *See* Griest, W.H., 6:26388
Guidry, M.W., *See* Lee, I.Y., 6:26587
Guillaume, M., *See* Lambrecht, R.M., 6:26009
Guin, J.A., *See* Tarrer, A.R., 6:24861
Gullicks, H.A., *See* Groenewold, G.H., 6:24927
Gulliksen, T., *See* Christophersen, N., 6:26205
Guminiak, R.F., *See* DePinto, J.V., 6:26236
Gunkel, W.W., *See* Neyeloff, S., 6:25893
Gunn, J., *See* Keller, W., 6:26358
Gunn, M.E. Jr., Recovery of industrial waste heat, 6:25619
Guralnik, G.S., *See* Bender, C.M., 6:26528, 6:26567
Gurney, M.D., Gasohol: laboratory and fleet test evaluation, 6:25885 (DOE/BETC/IC—80/3(Vol.4), pp 13p, Paper 16)
Guse, M.P., Atoms in molecules approach to density functional theory, 6:26462
Guvanasen, V., *See* Kanehiro, B.Y., 6:25114
Guzek, J.C., Thermal hydraulics of handling FFTF fuel in sodium and argon, comparing test results with calculated, 6:25494 (HEDL-SA—2203-FP)
Gvozdic, N., Kinetics of free radical decay reactions in irradiated isotactic polypropylene, 6:26004

H

Haake, K., *See* Policastro, A.J., 6:25459
Haaland, D.M., Applications of Fourier transform infrared spectroscopy to in situ catalyst surface studies, 6:25982 (SAND—80-2594C)
Habegger, L., Technology assessment of solar energy systems: air-quality effects of direct-solar and biomass systems in high- and low-deployment scenarios, 6:25229 (ANL/EES-TM—140)
Haerendel, G., *See* Sckopke, N., 6:26441

Hagedorn, N.H., NASA preprototype redox storage system for a photovoltaic stand-alone application, 6:25669 (DOE/NASA/12726—8)
Hagman, W.H., *See* Conley, P.L., 6:25481
Hagvar, S., Effects of acid precipitation on soil and forest. 7. Soil animals, 6:26354 (CONF-800365—, pp 202-203)
Hains, J.J., *See* Schindler, J.E., 6:26219
See Waide, J.B., 6:26220
Halbach, K., *See* Winick, H., 6:26073
Halbgewachs, R.D., Sandia Computing Network NOS link conceptual design, 6:26727 (SAND—81-0859)
Hale, G.J., dc sputter gold deposition on beryllium-copper contacts, 6:26050 (BDX—613-2629)
Hall, G., *See* Michaels, K., 6:25666
Hall, R.C., *See* Gardner, J.F., 6:24854, 6:24855
Hall, R.J., Ecologicall effects of experimental acidification on a stream ecosystem, 6:26387 (CONF-800365—, pp 375-376)
Haller, E.E., *See* Walton, J.T., 6:26079
Hallquist, J.O., *See* Nutt, G.L., 6:26092
Halzen, F., New quark and weak boson signatures at p-barp colliders, 6:26536
See Barger, V., 6:26481
Hamasaki, M., Study on high-temperature corrosion resistance of Zircaloy-4 with spheroidized hydrides, 6:25932
Hamasaki, S., *See* Lipson, J., 6:26646
Hambourger, P.D., Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Hamel, W.R., *See* Brown, C.H. Jr., 6:24946
See Canright, G.S., 6:24947
Hamil, R.A., *See* Patterson, E.L., 6:26072
Hamilton, G., Energy: comparative energy consumption of space and water heating appliances, 6:25730
Hamilton, J.H., *See* Wells, J.C., 6:26586
Hamlin, C., Profile of air quality in Region V, 6:26171 (PB—81-116097)
Hammer, C.L., Statistical mechanics of kinks and central peak phenomena in phi^4 theory for T< or =T/sub c/, 6:26478
Hammer, P.A., *See* Dale, A.C., 6:25354
Hammond, P.Y., Project Monitor: Part II. Conservation in small business: an exploratory study. Final report, 6:25718 (DOE/CS/10220—T1)
Hammond, R.B., Design and fabrication of a high-damage threshold infrared Smattt interferometer, 6:26696 (LA-UR—81-1395)
Hamrick, J.T., Efficiency improvements in irrigation well pumps, 6:25809
Handy, L.L., *See* Amaefule, J.O., 6:25026
Hanes, M.H., *See* Hopkins, R.H., 6:25250
Hanna, S.R., Lagrangian and Eulerian time-scale relations in the daytime boundary layer, 6:26103
Hannula, J.K., Integrating site locational criteria for underground housing, 6:25698 (CONF-800438—, pp 55-63)
Hansen, H., *See* Schelbert, H.R., 6:26310
Hansen, P., Government procurement of cement and concrete containing fly ash, 6:24928 (EPA/600/9—81-019B, pp 701-710)
Hansen, R.S., Overview of current status of solid-gas interface science, 6:25239 (CONF-8006156—, pp 97-104)
VII. Overview of current status of solid-gas interface science, 6:25979 (IS-M—316)
See Brodsky, M.B., 6:25244
Hanseth, E.J., *See* Leibowitz, L.P., 6:25310
Hanson, G., *See* Schindler, R.H., 6:26486
Hanssen, J.E., Atmospheric deposition of trace elements in Norway, 6:26124 (CONF-800365—, pp 116-117)
Hansson, K., *See* Almen, K.E., 6:26405
Happel, J., Development of catalysts for coal conversion. Annual report for 1979, 6:24871 (PB—81-111395)
Hardy, J.R., *See* Karo, A.M., 6:26615
See Walker, F.E., 6:26099
Hardy, W.E. Jr, *See* Nelson, R.G., 6:25601
See Nissan, E., 6:26160
Harley, J.H., Experience with an analytical quality-control program, 6:25976
Harmon, B.N., *See* Stassis, C., 6:25933
Harrar, J.E., Method for inhibiting silica precipitation and scaling in geothermal flow systems, 6:25398
Harrell, J.D., Study for compacting the explosive LX-17, 6:26097 (MHSMP—81-28)
Harriman, R., Ecology of acid streams draining forested and non-forested catchments in Scotland, 6:26280 (CONF-800365—, pp 312-313)
See Wright, R.F., 6:26264, 6:26285
Harrington, K., *See* Labs, K., 6:26194
Harris, D.L., *See* Halbgewachs, R.D., 6:26727
Harris, J., *See* Winick, H., 6:26073
Harris, Y., *See* Warholic, G.R., 6:24906, 6:24935
Harrison, M., *See* Yager, P.M., 6:26487
Harrison, R.H., *See* Good, W.D., 6:24899
Harrison, W., Efficacy of activated sludge/powdered activated carbon for removal of organic constituents in wastewater from commercial-scale, high-Btu coal gasification plant, 6:24925 (CONF-8006171—2)
Harte, J., Making microcosms an effective assessment tool, 6:26216
See Tonnessen, K., 6:26281
Hartford, J.R., *See* Spillman, C.K., 6:25811
Hartley, J.N., Asphalt emulsion sealing of uranium mill tailings. 1980 annual report, 6:25133 (PNL—3752)
Hartman, J.S., *See* Butler, B.L., 6:25245
Hartman, M., *See* Kebely, V., 6:26717
Hartmann, H.J., *See* Taub, F.B., 6:26234
Hartner, G., *See* Martin, J., 6:26077
Harvey, C.J., *See* Morris, C.L., 6:26579
Harvey, D.G., Role of the industrial energy conservation in the US energy program, 6:25764 (CONF-800272—, pp 1-5)
Harvey, D.M., *See* Gardner, J.F., 6:24854
Harvey, H.H., Widespread and diverse changes in the biota of North American lakes and rivers coincident with acidification, 6:26340 (CONF-800365—, pp 93-98)
Hasegawa, T., *See* Turner, A.P.L., 6:25898
Haseman, G.M., *See* Moss, M., 6:26430
Hassam, A.B., *See* Drake, J.F., 6:26648
Hasselriis, F., ECO-FUEL/sup R/II: the third generation, 6:25827 (ANL/CNSV-TM—60, pp 243-271)
Hassett, D.J., *See* Groenewold, G.H., 6:24927
Hastings, R.D., *See* Nixon, K.V., 6:26078
Hatch, M.J., *See* Martin, F.D., 6:25018
Hatch, W.E., Support for the analytical tools for automotive fuel economy activities. Final report 30 Nov 77-1 Jul 80, 6:25867 (PB—81-109555)
Hatcher, R.D. Jr, *See* Odom, A.L., 6:26416
Haucke, H.J., *See* Warkentin, P.A., 6:26479
Hausler, D.W., Trace metal distribution in fractions of solvent-refined coal by icp-oes and implications regarding metal speciation, 6:24917
Haustein, P.E., Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$, 6:26583 (BNL—29658)
Haverland, R.A., Reducing explosion damage in primary and secondary refuse shredders, 6:25826 (ANL/CNSV-TM—60, pp 155-161)
Hawke, R.S., Railguns for equation-of-state research, 6:26026 (UCRL—85298)
Hawkins, E.F., *See* Smith, R.D., 6:25109
Hay, D.W., Disproportionation of semimethylene blue and oxidation of leucomethylene blue by methylene blue and by Fe(III). Kinetics, equilibria, and medium effects, 6:26001
Hay, R.D., *See* Jarvinen, P.O., 6:25578
Hayatsu, R., Investigation of aqueous sodium dichromate oxidation for coal structural studies, 6:24919
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
Hayes, D.B., Thermal-viscous model for heterogeneous yielding in aluminum, 6:25915 (SAND—81-0108C)
Hayes, K.G., *See* Schindler, R.H., 6:26486
Hayes, R.L., *See* Jay, M., 6:26008
Haynes, R.A., *See* Halbgewachs, R.D., 6:26727
Hazell, W.J., Shredding for prepared fuel systems, 6:26054 (ANL/CNSV-TM—60, pp 81-99)
Hazzard, N.D., *See* Cunningham, J.A., 6:26058
He, G., *See* Casavecchia, P., 6:26460
Heap, M.P., *See* Nelson, L.P., 6:25795
Heath, R.T., Are microcosms useful for ecosystem analysis, 6:26226
Heath, S.B., *See* Willoughby, J.K., 6:24988
Hebard, H.D., *See* Bergman, W., 6:26162
Hecht, N.L., Obtaining improved products from the organic fraction of municipal solid waste. Final report, 6:25843 (PB—81-110918)
Heckes, A.A., Summary report on low invasion coring fluids, 6:24987 (DOE/BETC/IC—80/3(Vol.1), pp 16p, Paper 13)
See McFall, A.L., 6:24994
Heemstra, R.J., *See* Donaldson, E.C., 6:24979
Heerwagen, D.R., *See* Emery, A.F., 6:25365
Heffelfinger, J., *See* Hansen, P., 6:24928
Heinis, J.J., *See* Baird, C.D., 6:25359
Heinle, D.R., *See* Elmgren, R., 6:26396
Heinold, D., *See* Yamartino, R.J., 6:26109
Heldt, L.A., *See* Bockris, J.O'M, 6:25243

Heller, E.J., Errors in the Wigner approach to quantum dynamics, 6:26621
Hellgeth, J.W., *See* Hausler, D.W., 6:24917
Helling, A.L., *See* Pronko, P.P., 6:25895
Henager, C.H. Jr., Reflectance modification through controlled surface texturing by sputter etching, 6:25383
Henderson, O.K., Commonwealth of Pennsylvania emergency preparedness and response: the Three Mile Island incident, 6:25566
Henderson, R.S., Semitropical marine microcosms: facility design and an elevated-nutrient-effects experiment, 6:26246
Hendrey, G.R., *See* Galloway, J.N., 6:26267, 6:26270
Hendry, C.D., Acid precipitation in Florida (USA): results of a statewide monitoring network, 6:26125 (CONF-800365—, pp 118-119)
Henline, P., Simplified plotting package for the LSI-11 computer and Tektronix terminals, 6:26718 (GA-A—16148)
Henning, W., Accelerator mass spectrometry and radioisotope detection at the Argonne FN tandem facility, 6:26070 (CONF-8006123—2)
See Yntema, J.L., 6:26064
Henninger, R.J., *See* Dobranich, D., 6:25529
Henriksen, A., Acidification of freshwaters: a large scale titration, 6:26248 (CONF-800365—, pp 68-74)
See Wright, R.F., 6:26264, 6:26285
Henrikson, L., Does the change of predator system contribute to the biotic development in acidified lakes, 6:26371 (CONF-800365—, pp 316)
Henry, D.J., Thermodynamic properties of crystals and melts based on calorimetric data and plagioclass-melt equilibria in the system albite-anorthite-diposide, 6:26427 (DOE/ER/10765—T1)
Henry, J.D., Electrostatic coalescence system with independent ac and dc hydrophilic electrodes, 6:25050
Henry, J.F., *See* Fraser, M.D., 6:25285
Henry, M.P., *See* Ghosh, S., 6:25819
Henschen, L., *See* Wos, L., 6:26626
Henshaw, T., Future of energy managers groups, 6:25625 (CONF-7910214—, pp vp, 6p)
Henson, L.J., *See* Crowe, J.L., 6:25453
Hepplemann, S., *See* Berg, D., 6:26509
Heppner, J.P., Cameo barium releases : E/sub parallel/ fields over the polar cap, 6:26440
Heredy, L.A., Isotopic investigation of the chemistry of coal hydroliquefaction, 6:24876
Herrmann, R., Aluminum mobilization in acid stream environments, Great Smoky Mountains National Park, USA, 6:26251 (CONF-800365—, pp 218-219)
Herskind, B., *See* Newton, J.O., 6:26588
Hervin, R.L., Technical assisTAnce report ta 80-33, Omaha waste pretreatment plant, omaha, Nebraska, 6:26150 (PB—81-111148)
Herzig, C., *See* Bussmann, W., 6:25918
Hess, C.T., *See* Davis, R.B., 6:26274
See Norton, S.A., 6:26271
Hester, R.D., *See* Neidlinger, H.H., 6:25028
Hetrick, D.M., Calculation of neutron and gamma-ray production cross sections for calcium from 8 to 20 MeV, 6:26581 (ORNL/TM—7752)
Hibbs, B.H., *See* Lissaman, P.B.S., 6:25427, 6:25428
Hickox, C.E., Numerical study of natural convection in a horizontal porous layer subjected to an end-to-end temperature difference, 6:26043
Hicks, D.L., TOODY-WONDY calculations of penetration events, 6:26062 (SAND—81-0050C)
Hicks, H.R., Nonlinear analysis of disruptions in the JIPP T-II tokamak, 6:26637 (ORNL/TM—7733)
Hiebert, J.C., *See* Bhatia, T.S., 6:26576
Higbie, P.R., *See* Baker, D.N., 6:26443
Hildebrand, S.G., *See* Gilliland, M.W., 6:25214
Hilfman, L., *See* Malloy, T.P., 6:25039
Hill, A.J. Jr., Design guides for cell atmosphere controls, utilities and fire protection, 6:26317 (DP-MS—81-1)
Hill, C.T., Penguins and the $\Delta I = 1/2$ rule, 6:26538
Hill, D., *See* Auer, I.P., 6:26489, 6:26490
Hill, E.F., Decontamination of LMFBR components: report of FY 1979 results, 6:25493 (DOE/SF/76026—T7)
Hill, J. IV, Microcosms in ecological modeling, 6:26217
Himel, T., *See* Schindler, R.H., 6:26486
Hinchliffe, I., QCD corrections to hadronic large p/sub T/ scattering, 6:26532
Hindman, J.C., *See* Katz, J.J., 6:26307
Hines, R.H., *See* Spillman, C.K., 6:25811
Hino, T., *See* Ehst, D.A., 6:26628
Hirata, H., Steady-state zooplankton community in a feedback culture system, 6:26228
Hirschfeld, H.E., Evaluation of the conservation potential of a refit energy management system (using a power line subcarrier) in a large, high-rise apartment complex, 6:25690 (BNL—51299)
Hitlin, D.G., *See* Schindler, R.H., 6:26486
Hnatow, M.A., *See* Happel, J., 6:24871
Ho, F., *See* Tzung, F., 6:25946
Ho, P.C., Adsorption on inorganic materials. 8. Adsorption of iodide on AgCl-filled carbon, 6:25973
Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980, 6:25033 (DOE/BETC/OR—19)
Hobaek, A., *See* Raddum, G.G., 6:26379
Hobbs, R.B. Jr., Solar central receiver heliostat mirror module development, 6:25306 (SAND—79-8189)
Hocott, C.R., *See* Sharp, J.M., 6:25016
Hodgins, L.W., *See* Nyborg, M., 6:26141
Hoff, H.A., *See* Bussmann, W., 6:25918
Hoffman, A.R., Airborne particulate soiling of terrestrial photovoltaic modules and cover materials, 6:25287
Hoffman, C.M., *See* Lockyer, N., 6:26502
Hoffman, D.K., *See* Chan, C., 6:26461
Hoffman, E.J., *See* Wisenberg, G., 6:26309
Hoffman, F.O., *See* Kaye, S.V., 6:26192
Hoffman, J., *See* Smith, R.P., 6:26067
Hoffman, J.G., *See* Martin, F.J., 6:25861
Hoffman, J.M., *See* Tisone, G.C., 6:26034
Hoffman, L.C., *See* Rudnicki, M.I., 6:25078
Hoffman, R.W., On-site flume studies for assessment of effluent impacts on stream aufwuchs communities, 6:26237
Overview of the solid/solid interface: mechanical stability, 6:25237 (CONF-8006156—, pp 55-68)
See Butler, B.L., 6:25245
Hohla, K., *See* Egger, H., 6:26037
Holland, R.E., Nuclear cross sections for light ions on ^{6}Li, 6:26577 (CONF-801111—47)
Hollander, H.I., *See* Sommerlad, R.E., 6:26059
Hollas, C.L., *See* Bhatia, T.S., 6:26576
Hollebeek, R.J., *See* Schindler, R.H., 6:26486
Hollingsworth, M. Jr., Interlaboratory comparison of the ASTM C 335 pipe insulation test, 6:25759
Hollis, P.R., *See* Kleinschmidt, R.F., 6:25012
Hollister, H., *See* Trauth, C.A. Jr., 6:25607
Holloway, L., *See* Koester, L.J., 6:26499
Holloway, P.H., Basic research needs and opportunities for characterizing the microstructure and microchemistry of interfaces, 6:25247 (CONF-8006156—, pp 215-237)
Limitations of ion etching for interface analysis, 6:25241 (CONF-8006156—, pp 115-133)
Holmes, J.A., *See* Hicks, H.R., 6:26637
Holt, R.J., Threshold photoneutron angular distribution and polarization studies of nuclei, 6:26591 (CONF-801111—48)
Holtkamp, D.B., *See* Morris, C.L., 6:26579
Holynski, R., *See* Ammar, R., 6:26504
Homhual, C., Microstructural and mechanical property evaluation of zinc oxide coated solar collectors, 6:25384
Hones, E.W. Jr., *See* Baker, D.N., 6:26443
See Forbes, T.G., 6:26439
See Sckopke, N., 6:26441
Hong, M., *See* Wu, I.h., 6:25957
Honig, M., *See* Weldon, D., 6:26695
Hooper, M., *See* Farooque, M., 6:25667
Hoornbeek, F.K., *See* Sawyer, P.J., 6:26327
Hoover, W.R., Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)
Hopke, P.K., *See* Roscoe, B.A., 6:25966
Hopkins, R.H., Silicon materials task of the low-cost solar-array project. Phase IV. Effects of impurities and processing on silicon solar cells. Twenty-second quarterly report, January 1981-March 1981, 6:25250 (DOE/JPL/954331—81/14)
See Rohatgi, A., 6:25274
Hopper, J.E., *See* Gaeke, M.E., 6:26305
Horelick, D., *See* Logg, C.A., 6:26090
Horgos, R.M., *See* Gerber, E.W., 6:25099
Hori, A.M., *See* Schroeder, T.A., 6:25419
Hornbeck, R.G., *See* Gardner, J.F., 6:24854, 6:24855
Horne, A.J., *See* Hoffman, R.W., 6:26237
Hornor, S.G., *See* Mitchell, M.J., 6:26231
Hornstra, F., *See* Christianson, C.C., 6:25586

Horntvedt, R., Effects of acid precipitation on soil and forest. 2. Atmosphere-vegetation interactions, 6:26351 (CONF-800365—, pp 192-193)
Horton, W. Jr., Drift modes in axisymmetric tandem mirrors, 6:26649
Hovarongkura, A.D., *See* Henry, J.D., 6:25050
Howard, J.B., Coal-devolatilization information for reactor modeling: assessment of data and apparatus availability with recommendations for research. Final report, 6:24860 (EPRI-AP—1803)
See Franklin, H.D., 6:24879
Howard, R.E., *See* Craighead, H.G., 6:25265
Howell, R.S., *See* DePinto, J.V., 6:26236
Howells, G.D., *See* Brown, D.J.A., 6:26359
See McWilliams, P.G., 6:26360
Howerton, W.B., *See* Pruett, D.J., 6:25100
Hsiao, K.H., *See* Fraley, L.D., 6:24967
Hsiue, G.H., Influence of Co-60 γ-ray on the stress relaxation of SBS type thermoplastic elastomer, 6:25943
Hsu, J.H., *See* Chein, C.L., 6:25897
Huang, C., Oscillator strength for principal series transitions to the high Rydberg states of potassium, 6:26468
Huang, C.Y., *See* Hambourger, P.D., 6:25951
Huang, H.S., *See* Livengood, C.D., 6:25638
Huang, K., Vortex excitations in the Weinberg-Salam theory, 6:26568
Huang, S.C., *See* Schelbert, H.R., 6:26310
Hub, K., *See* VaKuiken, J., 6:25438
Hudson, E.A., *See* Goettle, R.J. IV, 6:25066
Hudson, J.B., *See* Sau, R., 6:26110
Hudson, J.L. Jr., Flue gas conditioning experience at Tampa Electric Company, 6:25455 (EPRI-WS—80-127, pp 3.16-3.28)
Huettenhain, H., Evaluation of chemical coal cleaning processes, 6:24954
Huey, R.J., *See* Cain, W.S., 6:26400
Huff, J.R., *See* Lynn, D.K., 6:25670
Huffman, W.J., *See* Ballantyne, W.E., 6:25205
Hughes, T.J., *See* Nichols, D.G., 6:24940
Hull, M., Earth shelters by inflation formed thin shell domes, 6:25706 (CONF-800438—, pp 172-176)
Hultberg, H., Acid groundwater in southwestern Sweden, 6:26252 (CONF-800365—, pp 220-221)
Humphrey, J., *See* Jensen, D.A., 6:26505
Hundemann, A.S., Energy policy and research planning. October, 1977-September, 1980 (Citations from the NTIS Data Base). Report for Oct 77-Sep 80, 6:25631 (PB—81-800112)
Hung, C.Y., Optimum model to predict radionuclide transport in an aquifer for the application to health effects evaluations, 6:25111 (CONF-801217—, pp 65-79)
See Meyer, G.L., 6:25167
Hunger, H.F., The charge and discharge behavior of molybdenum trioxide electrodes in lithium perchlorate-propylene carbonate electrolyte. Technical report, 6:25581 (AD-A—090346)
Hunt, C.D., Conversion of dissolved manganese to particulate manganese during diatom bloom: effects of the manganese cycle in the MERL microcosms, 6:26245
Hunt, H.W., *See* Elliott, E.T., 6:26180
Hunt, T.F. Jr., Waste flow control - the public perspective, 6:25833 (ANL/CNSV-TM—60, pp 483-488)
Hurley, C., Produced fluid emulsions associated with surfactant-polymer flooding, 6:25014 (DOE/BETC/IC—80/3(Vol.2), pp 6p, Paper 15)
Hurst, D.R., *See* Knight, J.A., 6:25184
Hurst, G.S., Resonance ionization spectroscopy: counting noble-gas atoms, 6:26451 (CONF-8106100—1)
Hurtubise, R.J., Separation and characterization of polycyclic aromatic hydrocarbons and alkylphenols in coal derived solvents, 6:24915
Hussain, A., *See* Hurtubise, R.J., 6:24915
Hussey, T.W., Diffusion of magnetic field into an expanding plasma shell, 6:26660
Hussmann, G.P., *See* Duty, R.C., 6:24920
Huston, J., *See* Berg, D., 6:26509
Huttunen, S., Air pollutants as additional stress factors of conifers under northern conditions, 6:26345 (CONF-800365—, pp 168-169)
Huxley, C.W., Energy management in a commercial organization, 6:25713 (CONF-7910214—, pp vp, 25p)
Hwang, I.T., Continuous-System-Modeling Program III: simulation of a solar collector under stagnation conditions, 6:25379 (CONF-800804—39)
Hyman, L.G., Superconducting compensator magnets to be used with the HRS spectrometer at the SLAC PEP facility, 6:26068 (CONF-800980—42)

I

Idzorek, J.J., *See* Brogan, T.R., 6:25653
Igo, G., *See* Zarbakhsh, F., 6:26488
Iijima, B., Can quarks have integer charge?, 6:26525
Ikoku, C.U., Optimization of air drilling operations, 6:24996 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 25)
Iles, M.K., Unified single-pass model of linewidths in the Haensch, single- and double-grating grazing-incidence dye lasers, 6:26041
Inal, O.T., Microstructural and mechanical property evaluation of black-chrome coated solar collectors. II, 6:25385
See Butler, B.L., 6:25245
See Homhual, C., 6:25384
Ingersoll, D.T., Final analysis of the GCFR exit shield integral experiment, 6:25496 (ORNL/TM—7839)
Ingham, J.G., *See* Guzek, J.C., 6:25494
Inhaber, H., Risks and consequences in energy production, 6:25608
Inkson, J., *See* Echenique, P.M., 6:26616
Innes, W.R., *See* Schindler, R.H., 6:26486
Inoue, N., Effects of intragrain defects on the local photoresponse of polycrystalline silicon solar cells, 6:25271
Irgolic, K.J., *See* Knapp, F.F., 6:26311
Irving, P.M., Response of field-grown soybeans to acid precipitation alone and in combination with sulfur dioxide, 6:26346 (CONF-800365—, pp 170-171)
Isaacs, G.A., Cost benefits associated with the use of physically cleaned coal. Final report May 78-Nov 79, 6:24952 (PB—81-113953)
Isakson, P., Solar housing in Sweden, 6:25374
Ishihara, S., Energy conservation at the Nippon Steel Corporation, 6:25790 (CONF-7910214—, pp vp, 137p)
Isseroff, R., *See* Cain, W.S., 6:26400
Ivanova, M., *See* Ammar, R., 6:26504
Iwasa, Y., *See* Tsukamoto, O., 6:26027

J

Jaakkola, S., Effect of artificial acid rain on the spectral reflectance and photosynthesis of Scots pine seedlings, 6:26347 (CONF-800365—, pp 172-173)
Jachimiak, Analysis of French investments in energy conservation technologies since 1974 and economic actions undertaken by the French government, 6:25782 (CONF-800272—, pp 288-299)
Jachter, M.H., *See* Cohen, A.E., 6:26100
Jackson, A.J., Thermal conductivity measurements on high-temperature fibrous insulations by the hot-wire method, 6:25684
Jackson, D.M., SRC-II demonstration program: a status report, 6:24895
Jackson, D.R., *See* Ausmus, B.S., 6:26178
Jackson, H.E., *See* McKeown, R.D., 6:26575
Jackson, J.A., Computerized waste-accountability shipping and packaging system, 6:25102 (MLM—2842(OP))
Jackson, M., *See* Cline, K.M., 6:26424
See Niccum, M., 6:26422
Jackson, S.B., *See* Crowe, J.L., 6:25453
Jacob, N.L., *See* Pedersen, L.D., 6:25814
Jacobsen, R.A., *See* Jassby, D.L., 6:26705
Jacobson, A.R., Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear, 6:26634 (LA—8828-MS)
Jacobson, J.S., Influence of rainfall composition on the yield and quality of agricultural crops, 6:26334 (CONF-800365—, pp 41-46)
Jaeger, H., *See* Reiter, R., 6:26143
Jaffe, L., Technical aspects and chronology of the Three Mile Island accident, 6:25543
Jaffe, R.L., *See* Iijima, B., 6:26525
Jain, K., Land biomass program. Annual report 1 Apr-31 Dec 79, 6:25254 (PB—81-113177)
Jain, R., *See* Durai-Swamy, K., 6:24859
James, M.R., *See* Morris, W.L., 6:25906
Jamison, T.D., Studies on Section XI ultrasonic repeatability, 6:25503 (EPRI-NP—1858)
Janes, H.W., *See* Mears, D.R., 6:25355
Jang, L.K., *See* Yen, T.F., 6:25027
Jankus, V.Z., *See* Smith, D.L., 6:26675

Jansen, L.A., Combined generation of electricity and heat in the dairy industry, 6:25803
Jaros, J.A., *See* Schindler, R.H., 6:26486
Jaroslow, B., *See* Gears, G.E., 6:25533
Jarvinen, P.O., Testing and evaluation of a solar photovoltaic flywheel energy storage system, 6:25578 (DOE/ET/20279—130)
Jassby, D.L., Resistive demountable toroidal-field coils for tokamak reactors, 6:26705 (PPPL—1809)
Jay, M., Synthesis and brain uptake of carbon-11 phenethylamine, 6:26008
Jayadev, T.S., Thermoelectric energy converter for generation of electricity from low-grade heat, 6:25658
Jean, Y.C., Temperature dependence of the Doppler-broadened positron annihilation spectra in single and polycrystalline Cd, 6:25925
Jefferson, R.M., Packaging configurations and handling requirements for nuclear materials, 6:26018 (CONF-810583—1)
Jeffries, D.S., *See* Dillon, P.J., 6:26249
Jellison, G.E. Jr., Optical properties of heavily doped silicon between 1.5 and 4.1 eV, 6:26438
Jenkins, K., *See* Barish, B., 6:26517
Jenkins, P.H., *See* Styron, C.E., 6:24905
Jenneman, G.E., *See* Munnecke, D.M., 6:24991
Jenni, P., *See* Schindler, R.H., 6:26486
Jennings, J.B., Relationship of permeability to confining pressure in low permeability rock, 6:24999 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 28)
Jennison, D.R., *See* Kelber, J.A., 6:26459
Jensen, A.J., *See* Spigarelli, S.A., 6:26296
Jensen, D.A., Measurement of the vector and axial vector coupling constants in $\Lambda^0 \rightarrow p + e^- + \text{nu-bar}$, 6:26505
Jensen, T., *See* Berg, D., 6:26509
Jepsen, O., *See* Schirber, J.E., 6:25924
Jercinovic, L.M., *See* Trauth, C.A. Jr., 6:25607
Jerger, D.E., Hybrid biothermal conversion of biomass to liquid fuels, 6:25194
Jeschke, P., Thermal conductivity of refractories: working with the hot-wire method, 6:25685
Jessop, E.S., *See* Cady, W.E., 6:25941
Jin, B., *See* Barish, B., 6:26517
Jody, B.J., *See* Bowman, R.M., 6:25672
Joergensen, P., *See* Rosenqvist, I. Th., 6:26260
Johannes, A.H., Atmospheric inputs to three Adirondack lake watersheds, 6:26268 (CONF-800365—, pp 256-257)
Snow pack storage and ion release, 6:26190 (CONF-800365—, pp 260-261)
See Galloway, J.N., 6:26270
Johannessen, M., Aluminum, a buffer in acidic waters, 6:26253 (CONF-800365—, pp 222-223)
Streamwater chemistry before, during and after snowmelt, 6:26254 (CONF-800365—, pp 224-225)
See Wright, R.F., 6:26265
Johansson, P.O., New generation - the Flakt recovery system, 6:25831 (ANL/CNSV-TM—60, pp 365-387)
Johnsen, T., *See* Raddum, G.G., 6:26379
Johnson, A.D., *See* Schindler, R.H., 6:26486
Johnson, B.R., *See* Randall, C.M., 6:25224, 6:25225
Johnson, D., Energy auditing and monitoring in local authorities, 6:25716 (CONF-7910214—, pp vp, 13p)
Johnson, D.H., *See* Green, H.J., 6:25320
Johnson, G.A., *See* Spillman, C.K., 6:25811
Johnson, I., Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)
See Shearer, J.A., 6:24956
See Smyk, E.B., 6:24955
Johnson, J.R., *See* Bowman, R.C. Jr., 6:25936
Johnson, J.S. Jr., Micellar-flood research: biopolymers, interfacial and phase behavior, and competitive adsorbates, 6:25020 (DOE/BETC/IC—80/3(Vol.2), pp 15p, Paper 21)
Johnson, K.J., *See* Clark, A.R., 6:26500
Johnson, L.A., *See* Marchant, L.C., 6:25081
Johnson, L.C., *See* Mansfield, D.K., 6:26040
Johnson, L.R., *See* Tobin, R.L., 6:24945
Johnson, L.S., *See* Wesche, T.A., 6:26297
Johnson, N.R., *See* Lee, I.Y., 6:26587
Johnson, P.V., *See* Weinbrandt, R.M., 6:25003
Johnson, R.H., *See* Ott, K.O., 6:25497
Johnson, R.P., *See* Clark, A.R., 6:26500
Johnson, R.R., *See* Slater, D.C., 6:26662
Johnson, S.A., Analytical techniques for ambient sulfate aerosols, 6:26111 (ANL—81-12)
Johnson, T.R., *See* Petrick, M., 6:25645
Johnson, W.L., Composition and octane number of US motor gasolines sampled in the Du Pont 1979 summer road octane survey, 6:25891 (DOE/BETC/IC—80/3(Vol.4), pp 3p, Paper 29)
Johnsrud, J., Reaction of the regulatory agency as viewed from the perspective of the public interest organization, 6:25562
Jonckheere, A., *See* Berg, D., 6:26509
Jones, C.D.E., Practical energy auditing, 6:25714 (CONF-7910214—, pp vp, 18p)
Jones, G. II, Organic photochemical storage of solar energy. Progress report, February 1, 1980-January 31, 1981, 6:25248 (DOE/ER/04380—T1)
Jones, G.J., Solar photovoltaic system engineering perspectives, 6:25256 (SAND—81-1164C)
Jones, H.G., Evolution of acidity in surface waters of Laurentides Park (Quebec, Canada) over a period of 40 years, 6:26255 (CONF-800365—, pp 226-227)
Jones, J.E., Motivation: its role in energy conservation, 6:25847 (CONF-7910214—, pp vp, 21p)
Jones, J.H., *See* Klaus, E.E., 6:25021
Jones, J.L., Thermal conversion of solid wastes and biomass, 6:25183
Jones, K.A., *See* Inoue, N., 6:25271
Jones, N.H., Conserving energy by eliminating waste, 6:25787 (CONF-7910214—, pp vp, 6p)
Jones, T.L., *See* Phillips, S.J., 6:25113
Joranger, E., Deposition of air pollutants in Norway, 6:26126 (CONF-800365—, pp 120-121)
See Horntvedt, R., 6:26351
See Mohn, E., 6:26258
Jordan, J., *See* Stutts, J.D., 6:24903
Joseph, J.W., Fleet experience using three blends of ethanol and unleaded gasoline, 6:25197
Joyce, T., *See* Berg, D., 6:26509
Judd, H.C., Ten years with turbine metering, 6:26030
Jung, J., Importance of shield design in minimizing radioactive-material inventory in tokamaks, 6:26670 (CONF-801011—85)
See Baker, C.C., 6:26678
See Ehst, D.A., 6:26628
Jurak, A., *See* Ammar, R., 6:26504
Jurgensen, M.F., *See* Sajdak, R.L., 6:25281

K

Kadlecek, J., *See* Tomlinson, G.H., 6:26133
Kadyk, J.A., *See* Schindler, R.H., 6:26486
Kaftanov, V., *See* Ammar, R., 6:26504
Kagan, J.A., Prediction of air quality impacts for stack emissions from the proposed Vienna unit No. 9, 6:25463 (PB—81-109720)
Kaiser, T.B., *See* Pearlstein, L.D., 6:26657
Kalbfleisch, G.R., *See* Miller, M., 6:26483
Kallend, A.S., *See* Brown, D.J.A., 6:26359
Kallfelz, J.M., *See* Biswas, D., 6:25489
Kallianpur, K.J., *See* Morris, C.L., 6:26579
Kalnavarns, J., *See* Jassby, D.L., 6:26705
Kalvenes, S., *See* Mohn, E., 6:26258
See Sevaldrud, I.H., 6:26385
Kam, K., *See* Kline, G., 6:25268
Kamal, I., Design study of the VTE boiler cycle for the desalination of sea water. Volume 1. Main report and Appendix A. Final report, 6:25449 (PB—81-113151)
Kamitakahara, W.A., Neutron-scattering study of hydrogen diffusion in thorium, 6:25930
Kampwirth, R.T., NbN materials development for practical superconducting devices, 6:26017 (CONF-800980—38)
Kane, G.L., Could Higgs bosons be found before LEP, 6:26565
Kane, R.J., *See* Moore, T.L., 6:26713
Kanehiro, B.Y., Aquifer response to earth tides, 6:26414 (LBL—12076, pp 120-129)
Fracture flow modeling for low-level nuclear waste disposal, 6:25114 (CONF-801217—, pp 187-196)
Kang, K., *See* Rothman, A.C., 6:26524
Kania, H.J., *See* Bowling, J.W., 6:26221
Kannberg, L.D., Compressed air energy storage technology program. Annual report for 1980, 6:25573 (PNL—3804)
Kanter, H.J., *See* Reiter, R., 6:26143
Kao, B., *See* Tzung, F., 6:25946
Kaplan, I.R., *See* Brand, S.W., 6:25055
Kapoor, S., *See* Carlisle, C.T., 6:24984
Karkheck, J., *See* Powell, J.R., 6:25834
Karkheck, J.P., Use of heat from dual-purpose power stations for district heating, 6:25621
Karlov, T.F., *See* Stafford, B.L., 6:25945

Karo, A.M., Theoretical studies of shock dynamics in two-dimensional structures. V. Microscopic constraints on shock-induced signals, 6:26615 (UCRL—85288)
See Walker, F.E., 6:26099
Kascak, A.F., The response of turbine engine rotors to interference rubs, 6:25855 (AD-A—090408)
Kasha, H., *See* Schmidt, M.P., 6:26560
Kasl, S.V., *See* Chisholm, R.F., 6:25551
Katainen, H.S., *See* Jaakkola, S., 6:26347
Katz, D.L., Capillary effects in rocks of the earth: influence on well behavior, 6:26428 (LBL—12076, pp 51-63)
Katz, J.J., Model systems in photosynthesis research, 6:26307 (CONF-800963—7)
Kaufman, A.N., *See* Cary, J.R., 6:26647
Kaufman, K.R., Highway fuel economy of gasohol and unleaded gasoline, 6:25894
Kautzky, H., *See* Ammar, R., 6:26504
Kawahara, F.K., *See* Tang, J.I.S., 6:24931
Kaye, S.V., Development and application of terrestrial food chain models to assess health risks to man and releases of pollutants to the environment, 6:26192 (IAEA-SM—254/63)
Kaymakcalan, O.S., Higgs phase in non-Abelian gauge theories, 6:26521 (LBL—12840)
Kayser, B., Quantum mechanics of neutrino oscillation, 6:26522
Kayser, M., *See* Crocker, M., 6:25047
Kazmerski, L.L., *See* Balluffi, R.W., 6:25242
Kearns, D.L., Chemically active fluid bed for SOX control. Volume I. process evaluation studies. Final report Jul 75-Oct 79, 6:24939 (PB—81-113946)
See Ulerich, N.H., 6:25445
Kebely, V., Development of an operational framework for the Liquid Fossil Fuel Cycle (LFFC), 6:26717 (DOE/BETC/IC—80/3(Vol.4), pp 7p, Paper 32)
Keefe, D.J., Enhancement of a radiation safety system through the use of a microprocessor-controlled speech synthesizer, 6:26076 (CONF-801103—59)
Kehler, M.A., *See* Willoughby, J.K., 6:24988
Kelber, J.A., Analysis of the Auger spectra of CO and CO_2 , 6:26459
Keller, J., *See* Bliesner, R.D., 6:25808
Keller, R.A., *See* Zalewski, E.F., 6:26039
Keller, W., Acidification impacts on lakes in the Sudbury, Ontario, Canada area, 6:26358 (CONF-800365—, pp 228-229)
Kellner, C.S., Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)
Kellomaki, S., *See* Jaakkola, S., 6:26347
Kelly, J.M., Sulfur distribution and flux in two forested watersheds in eastern Tennessee, 6:26256 (CONF-800365—, pp 230-231)
Kelly, R.F., *See* Gipson, G.L., 6:26173
Kemp, W.M., Microcosms, macrophytes, and hierarchies: environmental research in the Chesapeake Bay, 6:26247
Kendall, P.W., *See* Cipolletti, J.P., 6:25356
Kennedy, L.A., *See* Chang, R., 6:26295
Kenney, V.P., *See* Cason, N.M., 6:26493
Kenton, M.A., *See* Cady, K.B., 6:25526
Kerekes, J.J., Preliminary characterization of three lake basins sensitive to acid precipitation in Nova Scotia, Canada, 6:26257 (CONF-800365—, pp 232-233)
Kerig, S., *See* Mihursky, J.A., 6:25465
Kerner, E.H., Universal formats for nonlinear ordinary differential systems, 6:26730
Kerns, Q., *See* Barish, B., 6:26517
Kershaw, R.P., *See* Pruneda, C.O., 6:25942
Kerth, L.T., *See* Clark, A.R., 6:26500
Ketels, P.A., *See* Brown, K.C., 6:25348
Keung, W.Y., *See* Barger, V., 6:26527, 6:26535, 6:26541
Khabarov, V.N., *See* Panchenkov, G.M., 6:26002
Khan, A.U., Energy transfer from PO excited states to alkali metal atoms in the phosphorus chemiluminescence flame, 6:25988
Khatamian, D., *See* Kamitakahara, W.A., 6:25930
Kidman, R.B., Reckoning THOR, 6:25514 (LA—8856-MS)
Kieffer, J., Support and utilization of the LSI-11 processor family at SLAC, 6:26728 (SLAC-PUB—2727)
Kiesling, E.W., *See* Behr, R., 6:25746
Killian, E.W., Advanced mobile multi-processor gamma-ray acquisition and analysis system. Topical report, 6:26080 (NUREG/CR—1668)
Killough, G.G., *See* Sims, C.S., 6:26612
Killpatrick, D.H., Method for manufacturing magnetohydrodynamic electrodes, 6:25655
Kim, H.J., *See* Wells, J.C., 6:26586
Kim, J., *See* McNeill, D.H., 6:26703
Kim, K.H., *See* Schwartzberg, H.G., 6:25358
Kim, S.H., *See* Evans, K. Jr., 6:26671
Kim, S.S., *See* Durai-Swamy, K., 6:24859
Kim, Y., *See* Shyn, T.W., 6:26465
Kimball, C.W., *See* Stafford, B.L., 6:25945
Kimball, H.T., *See* Gibbs, L.L., 6:26061
King, C.R., Fibrous insulation heat-transfer model, 6:25689
King, D.L., Some cautions in applying results from aquatic microcosms, 6:26218
King, I.P., *See* Arnett, R.C., 6:25135
King, W.E., Computer simulation study of the displacement threshold-energy surface in Cu, 6:25920
Determination of the threshold-energy surface for copper using in-situ electrical-resistivity measurements in the high-voltage electron microscope, 6:25919
Kinnaird, J.W., *See* Fowler, D., 6:26341
See Nicholson, I.A., 6:26136, 6:26137, 6:26138
Kipp, K.L., *See* Grove, D.B., 6:25110
Kippenhan, C.J., *See* Emery, A.F., 6:25365
Kirchner, W.L., *See* Dallman, J.C., 6:26042
Kirk, T.B.W., *See* Koester, L.J., 6:26499
Kirshen, P.H., Small-scale hydro in New England: 1960-1976, 6:25215
Kirtley, J.L. Jr., *See* Conley, P.L., 6:25481
Kiskis, J., Calculability of the N-P mass difference in gauge theories, 6:26543
Kitchens, W.M., Succession in laboratory microecosystems subjected to thermal and nutrient-addition stresses, 6:26235
Klabunde, K.J., *See* Baltisberger, R.J., 6:24853
Klarsfeld, S., *See* Degenne, M., 6:25682
Klass, D.L., Biomass as a nonfossil fuel source, 6:25280
Klaus, E.E., Surfactant synthesis, polymer buffer and surfactant slug design for the tertiary recovery of the Pennsylvania grade crude oil, 6:25021 (DOE/BETC/IC—80/3(Vol.2), pp 13p, Paper 22)
Kleinman, D.A., *See* Miller, R.C., 6:25955
Kleinman, L.I., *See* Meyers, R.E., 6:26114
Kleinschmidt, R.F., North Burbank Unit tertiary recovery pilot test, 6:25012 (DOE/BETC/IC—80/3(Vol.2), pp 8p, Paper 12)
Klepper, O.H., Economics of selected fuels for new industrial steam capacity, 6:25821
Kliewer, K.L., *See* Brodsky, M.B., 6:25244
Klimkowsky, B.F., Setting up a photographer to do a good job, 6:26714 (UCRL—86304)
Kline, G., Efficient and stable photoelectrochemical cells constructed with WSe_2 and $MoSe_2$ photoanodes, 6:25268
See Stassis, C., 6:25933
Klopatek, J.M., *See* Gilliland, M.W., 6:25214
Klosterman, H.J., *See* Kaufman, K.R., 6:25894
Kluck, A.L., *See* Germer, J.H., 6:25504
Klumb, D.L., Issues for refuse derived fuels as applied to utility boilers, 6:25437 (ANL/CNSV-TM—60, pp 403-411)
Klyukhin, V., *See* Ammar, R., 6:26504
Knab, D., *See* Gladney, E.S., 6:26432
Knapp, F.F., Myocardial uptake of sup(123m)Te-labeled long-chain fatty acids. Effects of heteroatom position and total chain length, 6:26311
Knight, J.A., Pyrolytic oils - characterization and data development for continuous processing. Report for Jun 76-Mar 80, 6:25184 (PB—81-110959)
Knight, R.L., *See* Bowling, J.W., 6:26221
Knight, T.D., TRAC-PD2 modeling of LOFT and PWR small cold-leg breaks, 6:25531 (LA-UR—81-1521)
See Duerre, K.H., 6:25532
Knoblauch, K., *See* Coleman, R.C., 6:24951
Knorovsky, G.A., Effect of strain-rate and microstructure on the ductile brittle transition temperature in structural steels: Part I. Literature assessment, 6:25910 (SAND—80-0732)
Knotek, M.L., *See* Bockris, J.O'M, 6:25243
Knox, J.B., Program report for FY 1980. Atmospheric and Geophysical Sciences Division of the Physics Department, 6:26161 (UCRL—51444-80)
Knudson, C.L., Hydrogen-carbon monoxide reactions in low-rank coal liquefaction, 6:24878
Kobrak, H.G.E., *See* Yager, P.M., 6:26487
Koch, B.A., *See* Spillman, C.K., 6:25811
Koehler, D.E., Maximizing efficiency of fuel production and utilization, 6:25856 (DOE/BETC/IC—80/3(Vol.4), pp 11p, Paper 17)
Koehler, P.F., *See* Berg, D., 6:26509
Koehler, W., *See* Clinard, L., 6:25605
Koehler, W.C., *See* Moon, R.M., 6:25947
See Stassis, C., 6:25933

Koehmstedt, P.L., *See* Hartley, J.N., 6:25133
Koelling, D.D., *See* MacDonald, A.H., 6:25921
Koester, L.J., Diffractive hadroproduction of charmed D mesons, 6:26499
Kohan, S.M., Preliminary economic overview of large-scale thermal conversion system using wood feedstocks, 6:25291
Kohl, F.J., *See* Stearns, C.A., 6:26010
Kohnken, K.H., *See* Cleveland, J.J., 6:25775
Kokoszenski, J., *See* Abdou, M.A., 6:26667
Kolganova, N., *See* Ammar, R., 6:26504
Komar, C., *See* Liebenthal, A.M., 6:25072
Komar, C.A., *See* Zielinski, R.E., 6:25067
Kondo, T., *See* Barish, B., 6:26517
Konheim, C., *See* Hasselriis, F., 6:25827
Kono, H., Size control of granules in pan and fluidized-bed granulators, 6:25987
Koploy, M., *See* Cheung, K.C., 6:25486
Koreshev, V., *See* Ammar, R., 6:26504
Kornfeld, J., *See* Bridges, J., 6:25083
Korth, G.E., Surface finish effects on the high-cycle fatigue of Alloy 718, 6:25903 (EGG-M—01981)
Kosinski, A.J., *See* Foster-Pegg, R.W., 6:25442
Koski, J.A., Analysis of thermal conductivity probes for high temperature applications, 6:25537 (SAND—81-0106)
Improved data-reduction methods for laser-pulse-diffusivity determination with the use of minicomputers, 6:26724 (SAND—80-2602C)
Kovac, R.J., *See* Knight, J.A., 6:25184
Kozlov, D.I., *See* Panchenkov, G.M., 6:26002
Kraft, K.J., Effect of fluctuating reservoir release on the downstream environment, 6:26288 (PB—81-115677)
Kramer, A., *See* Wheaton, F.W., 6:25818
Kramer, S.D., *See* Hurst, G.S., 6:26451
Kraus, K.A., *See* Ho, P.C., 6:25033, 6:25973
Krause, H.H., High-temperature corrosion and fouling in oil-fired power plants, 6:25062 (EPRI-WS—80-127, pp 2.1-2.8)
Refuse-derived fuels, 6:25844
Summary of the discussion-group sessions on high-temperature corrosion and fouling in oil-fired boilers, 6:25064 (EPRI-WS—80-127, pp 2.59-2.62)
Use of fuel additives in oil firing, 6:25061 (EPRI-WS—80-127, pp 1.19-1.32)
Krause, K.F., *See* Dowgiallo, E.J. Jr, 6:25877
Kreiner, A.J., High spin structure of ^{73}Br and the (N,Z) dependence of the nuclear deformation in the Br region, 6:26585
Kreisler, M.N., *See* Jensen, D.A., 6:26505
Kreith, F., Heat transfer and the future of solar energy utilization, 6:25221
Kremer, F., *See* Fradkin, L., 6:25179
Kretschmann, E., *See* Chung, M.S., 6:26472
Krishnaswamy, S.V., *See* Das, M.B., 6:25260
Kristensen, P.E., Solar housing in Denmark, 6:25375
Kruse, U., *See* Koester, L.J., 6:26499
Krzywdzinski, S., *See* Ammar, R., 6:26504
Kubantsev, M., *See* Ammar, R., 6:26504
Kuehn, T.H., *See* Szydlowski, R.F., 6:25738
Kuhl, D.E., *See* Schelbert, H.R., 6:26310
See Wisenberg, G., 6:26309
Kuhl, W.D., *See* Bergman, W., 6:26162
Kulander, K.C., Laser-collision induced chemical reactions: A comparison of quantum mechanical and classical model results, 6:25999
Kulik, I.O., *See* Gogadze, G.A., 6:26619
Kumar, K., *See* Wells, J.C., 6:26586
Kumar, R., *See* Johnson, S.A., 6:26111
Kupperman, D.S., Development of nondestructive-evaluation techniques for high-temperature ceramic heat-exchanger components. Semiannual report, October 1980-March 1981, 6:25934 (ANL/MSD/FE—81-1)
Kutscher, C.F., Application of solar thermal energy to buildings and industry, 6:25349 (SERI/TP—641-1222)
Kutschera, W., *See* Henning, W., 6:26070
See Yntema, J.L., 6:26064
Kuwabara, J.S., *See* North, W.J., 6:25283
Kuznetsov, O., *See* Ammar, R., 6:26504
Kwak, J.F., Magnetic quantum oscillations in tetramethyltetraselenafulvalene-hexafluorophosphate [$(TMTSF)_2PF_6$], 6:25959
Kwak, N., *See* Ammar, R., 6:26504
Kway, W.L., *See* Byer, R.L., 6:26036
Kydes, A.S., Energy/economic model analysis. Time-stepped energy system optimization model. Final report, 6:25595 (PB—81-114241)

L

Labs, K., Earth tempering as a passive design strategy, 6:25362
Investigations into ground climate as an alternative thermal building environment, 6:26194 (CONF-800438—, pp 76-93)
Lach, J., Small angle hadron proton elastic scattering at Fermilab energies, 6:26496
See Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
LaFontaine, G., High temperature bonding techniques for solar cell array. Final report Mar 76-Jun 77, 6:25293 (AD-B—028686/4)
Lai, Y.Z., *See* Sajdak, R.L., 6:25281
Laine, E.F., Detection of water-filled and air-filled underground cavities, 6:26420 (UCRL—53127)
Laine, K., *See* Huttunen, S., 6:26345
Laing, W.R., *See* Gilai, D., 6:25507
Lakshmanan, S., *See* Mathur, V.K., 6:24841
LaMarca, M.E., Irreversible denaturation mapping of a pyrimidine-rich domain of a complex satellite DNA, 6:26318
Lamarsh, J.R., Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Lambert, J.D.B., *See* Mahagin, D.E., 6:25495
Lambrecht, R.M., Production, radiochemistry, and cross-section measurements for $^{103-105}$Ag, 6:26009
Lamich, D., *See* Yamartino, R.J., 6:26109
Lampe, F.W., Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines. Progress report, August 16, 1980-April 30, 1981, 6:25996 (DOE/ER/03416—21)
Lan, J.S., Assessment of the prevailing physics codes: LEOPARD, LASER, and EPRI-CELL, 6:25502 (HEDL-SA—2323)
Lander, G.H., Magnetization density in paramagnetic UGe_3, 6:25962
See Burlet, P., 6:25963
Landman, U., *See* Brodsky, M.B., 6:25244
Landsman, E.E., Analysis and test of line-commutated inverters for use in photovoltaic power systems, 6:25296 (DOE/ET/20279—115)
Landt, J.A., *See* Miller, E.K., 6:26625
Laney, R., Natural annealing of pleochroic haloes in biotite samples from deep drill holes, Fenton Hill, New Mexico, 6:26418
Langacker, P., *See* Barger, V., 6:26544
Lange, C.S., Biological effects of ionizing radiation at the molecular, cellular, and organismal levels. Progress report, October 15, 1978-October 14, 1981, 6:26316 (DOE/EV/10503—1)
Langhans, R.W., *See* Albright, L.D., 6:25353
Langley, J.B., Earth covered barrel shell structures, 6:25745
Langlois, G., *See* Elmgren, R., 6:26396
Lankford, A.J., *See* Schindler, R.H., 6:26486
Lansford, R.R., Economic analysis of wind energy for irrigation pumping, 6:25430
Lansing, N.F., Applications of fireside additives to utility boilers: workshop proceedings, 6:24958 (EPRI-WS—80-127)
Lappala, E.G., Modeling of water and solute transport under variably saturated conditions: state of the art, 6:25112 (CONF-801217—, pp 81-137)
Large, D.E., USDOE needs in modeling for low-level radioactive waste management, 6:25106 (CONF-801217—, pp 3-8)
LaRoche, G., *See* Gears, G.E., 6:25533
Larsen, E.A., Hazard analysis for 10 MW/sub e/ solar thermal central receiver pilot plant. Supplement 1. Final report, 6:25303 (MCR—78-1331A)
Larsen, E.W., Linear transport in nonhomogeneous media., 6:26611
Larsen, I.L., Strontium-90 determinations by Cerenkov radiation counting for well monitoring at Oak Ridge National Laboratory, 6:25970 (ORNL/TM—7760)
Larsen, R.C., *See* Schmidt, M.P., 6:26560
Larsen, R.R., *See* Schindler, R.H., 6:26486
Larson, T.C., *See* Racine, W.C., 6:25408
Larsson, R., Energy conservation campaign at Sandvik A.B. in Sandviken, 6:25792 (CONF-7910214—, pp vp, 10p)
Lasche, G.P., Magnetic confinement of fusion plasmas, 6:26664
Laughlin, A.W., *See* Laney, R., 6:26418
Lauvray, T.L., Calibrated hot-box approach for steady-state heat-transfer

measurements in air duct systems, 6:25762
Laverty, D.H., *See* Nyborg, M., 6:26141
Lavy, M.W., *See* Nelson, L.P., 6:25795
Lawless, K.R., *See* Holloway, P.H., 6:25247
Lawson, M.J., *See* Cason, N.M., 6:26493
Laxton, J.W., *See* Dominey, D.A., 6:25063
Leaderer, B.P., *See* Cain, W.S., 6:26400
LeBritton, J., *See* Miller, M., 6:26483
LeChevalier, R., *See* Noreen, D., 6:25328
Lee, A.L., Evaluation of coal conversion catalysts. Annual report, 6:24870 (PB—81-111387)
Lee, C., *See* Voelker, J., 6:25639
Lee, D.W., Analytical model of the round buoyant jet, 6:26142 (CONF-810621—5)
Lee, G.C.Y., Cyclic reheat for FGD: status report. Final report, 6:25454 (EPRI-CS—1843)
Lee, I.Y., Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near N~50, 6:26587
Lee, J., *See* Barish, B., 6:26517
Lee, J.J., *See* Glass, N.R., 6:26123
Lee, S.H.D., *See* Johnson, I., 6:25436
Lee, W., *See* Palazzo, D.F., 6:24896
Lee, Y.T., *See* Casavecchia, P., 6:26460
Leffler, J.W., Microcosmology: theoretical applications of biological models, 6:26213
Legacey, D., *See* Dankowych, J.A., 6:26492
Legrand, M., *See* Delmas, R.J., 6:26181
Lehman, D.R., Numerical evaluation of integrals containing a spherical Bessel function by product integration, 6:26731
Lehmann, B.E., *See* Hurst, G.S., 6:26451
Leibowitz, L.P., High temperature solar thermal technology, 6:25310
Leifeste, G.T., *See* McClenahan, C.R., 6:26710
Leigh, R.W, Storage in residential solar total-energy systems, 6:25389 (BNL—51230)
Leijendeckers, P.H.H., Solar housing in the Netherlands, 6:25373
Leipuner, L.B., *See* Schmidt, M.P., 6:26560
Leivestad, H., Acid stress in trout from a dilute mountain stream, 6:26372 (CONF-800365—, pp 318-319)
See Muniz, I.P., 6:26339, 6:26373
Lenz, T.G., *See* Murphy, V.G., 6:25406
Leon, P.A., *See* McDonald, W.J., 6:25403
Leone, E.Y., *See* Wada, R.Y., 6:26154
Leone, S.M., *See* Stern, S.A., 6:25516
Lepage, G.P., *See* Brodsky, S.J., 6:26548, 6:26553
Leppin, D., U-gas technology status. II, 6:24888
Lesinski, J.A., *See* Fabijanowski, J., 6:26344
Lester, D.H., *See* Stoddard, J.A., 6:25168
Leung, K.N., *See* Berkner, K.H., 6:26454
Leveille, J.P., Leptoproduction of heavy quarks, 6:26534
See Barger, V., 6:26539, 6:26544
Leventhal, P., Reaction of Congress to the accident at Three Mile Island, 6:25557
Levin, A., Description of the turbulent fragmentation of a puff in the turbulent flow with the large Reynold's numbers, 6:26104 (BNL—51385)
Remarks on the description of the statistical features of the turbulent diffusion of a puff, 6:26105 (BNL—51386)
Levin, H., *See* LaFontaine, G., 6:25293
Levine, E.P., *See* Santini, D.J., 6:25624
Levine, R.D., Electronic excitation in molecular collisions: structural, dynamic and kinetic considerations. Annual summary report no. 2, Sep 79-Aug 80, 6:26445 (AD-A—090287)
Levis, A.H., ALINET: a model for assessing energy conservation opportunities in food processing, 6:25815
Levis, I.S., *See* Levis, A.H., 6:25815
Levy, D., *See* Harte, J., 6:26216
Levy, M.T., Designer's first experience with troglodyte subculture, 6:25324 (CONF-800438—, pp 141-154)
Lewin, K.F., *See* Evans, L.S., 6:26331
Lewis, A.C., *See* Smith, P.D., 6:25485
Lewis, D.S., Addendum to: 'environmental assessment: source test and evaluation report--Chapman low-Btu gasification'. Final report Mar 79-Sep 80, 6:24936 (PB—81-113003)
Lewis, D.W., Applications of polymer extrusion technology to coal processing, 6:24953
Lewis, L.F., Ocean energy technologies: an environmental overview, 6:25321
Lewis, M.R., *See* Kemp, W.M., 6:26247
Lewis, S.G., Prepared fuel systems: selecting an option, 6:25200 (ANL/CNSV-TM—60, pp 3-15)
Li, T.Y., *See* Meyers, R.E., 6:26114
Liberatore, A.J., *See* Martin, J.W., 6:24897
Libicki, S.B., *See* Campbell, J.H., 6:25087
Lichtenberg, A.J., *See* Bravenec, R.V., 6:26656
Lichtenstein, E.P., Fate and behavior of pesticides in a compartmentalized microcosm, 6:26193
Lichtin, N.N., *See* Hay, D.W., 6:26001
Lichtman, D., Limitation of experimental capabilities for interfacial studies, 6:25240 (CONF-8006156—, pp 105-113)
See Holloway, P.H., 6:25247
Lide, R.W., *See* Bingham, C.R., 6:26592
Liebenthal, A.M., Economic analysis of foam fracturing in the Devonian shales: preliminary report, 6:25072
Lieberman, M.A., *See* Bravenec, R.V., 6:26656
Liew, Y.K., *See* Hsiue, G.H., 6:25943
Liewer, P.C., Particle simulations of a finite-length free electron laser, 6:26038
Likens, G.E., *See* Hall, R.J., 6:26387
Liles, D.R., *See* Mahaffy, J.H., 6:25528
Lillie, R.A., Neutron and gamma-ray streaming calculations for the ETF neutral-beam injectors, 6:26630 (CONF-810606—46)
Lime, J.F., *See* Knight, T.D., 6:25531
Lin, A.T., *See* Liewer, P.C., 6:26038
Lin, S.C., *See* Hamasaki, M., 6:25932
Lindeken, C.L., *See* Toy, A.J., 6:26200
Lindell, M.K., *See* Greene, M.R., 6:25131
Linden, A., Energy to the year 2000: a comparison of energy strategies, 6:25627
Linden, J.C., *See* Murphy, V.G., 6:25406
Lindenberger, K.H., *See* Newton, J.O., 6:26588
Linehan, P.W., *See* Miller, R.G., 6:25753
Linn, J.K., *See* Sample, D.G., 6:24873
Linnerooth, T.B., Code translation program for Hewlett-Packard computers, 6:26726 (SAND—81-0627)
Linville, B., Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980, 6:25000 (DOE/BETC/IC—80/3(Vol.2))
Processing and utilization. Annual report, October 1, 1979-September 30, 1980, 6:25054 (DOE/BETC/IC—80/3(Vol.4))
Resource assessment. Annual report, October 1, 1979-September 30, 1980, 6:24975 (DOE/BETC/IC—80/3(Vol.1))
Linzon, S.N., Soil resampling and pH measurements after an 18-year period in Ontario, 6:26184 (CONF-800365—, pp 176-177)
Liou, K.Y., Observations on grain-boundary structures in nickel oxide, 6:25935 (CONF-800765—10)
Lipkin, H.J., Importance of the Keta and Keta' decay modes in understanding charmed and other meson decays, 6:26529
Past lessons and future importance of polarization, 6:26559 (ANL-HEP—80-77)
Lippert, T.E., Open-cycle MHD technology status and development perspective: operational analysis of open-cycle MHD, 6:25652 (EPRI-AP—1864)
See Ciliberti, D.F., 6:25444
Lippmann, M.J., *See* Mangold, D.C., 6:26475
Lipsitt, E.D., *See* Cain, W.S., 6:26400
Lipson, J., Scaling studies in field reversal experiments, 6:26646
Lis, S., *See* Squillante, M.R., 6:25257
Lissaman, P.B.S., Advanced and innovative wind energy concept development: dynamic inducer system. Executive summary, 6:25427 (SERI/TR—8085-1-T1)
Advanced and innovative wind energy energy concept development: dynamic inducer system. Research report, 6:25428 (SERI/TR—8085-1-T2)
Lister, C.J., *See* Haustein, P.E., 6:26583
Little, C.A., Modeling and low-level waste management: an interagency workshop, 6:25105 (CONF-801217—)
Liu, B.C., Reduced-form approach for evaluating hospital cost-containment program in paired experiment, 6:26402 (CONF-8008109—1)
Liu, K.T., *See* Feldman, H.F., 6:25190
Liu, L., *See* Chang, R., 6:26295
Livengood, C.D., Economic and environmental tradeoffs in coal conversion, 6:25638 (CONF-800608—8)
Loar, J.M., *See* Cada, G.F., 6:25462
Lobitz, D.W., VAWTDYN--a numerical package for the dynamic analysis of vertical axis wind turbines, 6:25434
Lobkowicz, F., *See* Berg, D., 6:26509
Locke, C.D., *See* Watts, R.J., 6:25036
Locke, F.E., *See* Harrar, J.E., 6:25398
Locklin, D.W., Overview of EPRI survey on fireside additives: excerpts from survey report, 6:24959 (EPRI-WS—80-127, pp 1.1-1.18)

Lockyer, N., Parity violation in proton-nucleus scattering at 6 GeV/c, 6:26502
Loemsland, E.E., *See* Raddum, G.G., 6:26379
Loewer, O.J. Jr, *See* Walker, J.N., 6:25805
Lofy, R.J., Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, Glendale, California. Final report, 6:25838 (DOE/CE/20237—1)
Logg, C.A., FASTBUS introduction and demonstration, 6:26090 (SLAC-PUB—2738)
See Kieffer, J., 6:26728
Lograsso, T.A., *See* Pronko, P.P., 6:25895
Lohm, U., Effects of experimental acidification on soil organism populations and decomposition, 6:26348 (CONF-800365—, pp 178-179)
Loken, S.C., *See* Clark, A.R., 6:26500
Lomanno, F., *See* Jensen, D.A., 6:26505
Long, J.C.S., Large-scale permeability testing at Stripa, 6:26406 (LBL—12076, pp 38-44)
Long, P.E., Relationships between internal structures and petrographic textures of basalt flows: example from a continental flood tholeiite province, 6:26429 (RHO-BWI-SA—67)
Longacre, R.S., *See* Dankowych, J.A., 6:26492
Longanbach, J.R., *See* Feldman, H.F., 6:25190
Longyear, A.B., Kelley Hot Spring Geothermal Project: Kelly Hot Spring Agricultural Center conceptual design, 6:25409 (GT—27041-4)
Loo, B.H., *See* Frese, K.W. Jr., 6:25954
Loomis, A., *See* Koester, L.J., 6:26499
Lord, J., *See* Ammar, R., 6:26504
Lorensen, L.E., *See* Harrar, J.E., 6:25398
Lorenz, P.B., Laboratory study of surfactant flooding in the Delaware-Childers field, 6:25001 (DOE/BETC/IC—80/3(Vol.2), pp 19p, Paper 1)
See Tham, M.K., 6:25002
Lorimer, A.D., *See* Lowes, T.M., 6:25785
Loubriel, G., *See* Rehn, V., 6:25983
Lovett, M.B., *See* Nelson, D.M., 6:26291
Lowes, T.M., Waste as a fuel, 6:25785 (CONF-7910214—, pp vp, 22p)
Loxsom, F., *See* Rudzki, J.E., 6:25226
Lu, K.C., *See* Bowman, R.M., 6:25672
Lucas, P., *See* Warkentin, P.A., 6:26479
Ludwig, J., *See* Barish, B., 6:26517
Lueth, V., *See* Schindler, R.H., 6:26486
Lula, J.W., *See* Scott, D.A., 6:26049
Lum, B.Y., *See* Bergman, W., 6:26162
Lum, J.W., Development document for proposed effluent limitations guidelines, new source performance standards, and pretreatment standards for the steam electric point source category. Interim report, 6:25469 (PB—81-119075)
Lunde, M.R., Precast concrete walls for earth sheltered construction, 6:25709 (CONF-800438—, pp 198-214)
Luner, V.A., *See* Tobin, R.L., 6:24945
Luo, H.L., *See* Hambourger, P.D., 6:25951
Lurmann, F., The ELSTAR stationary source emissions data preprocessor. Software, 6:26157 (PB—81-114381)
Lush, D.M., Energy management systems in buildings, 6:25712 (CONF-7910214—, pp vp, 19p)
Luthy, R.G., *See* Stamoudis, V.C., 6:24924
Lutz, S.S., *See* Roeske, F., 6:26083
Lynch, V.E., *See* Hicks, H.R., 6:26637
Lynn, D.K., Design considerations for vehicular fuel cell power plants, 6:25670 (LA-UR—81-1054)
Lynn, K.G., *See* Jean, Y.C., 6:25925
Lyon, R.N., Direct-contact heat exchangers for OTEC: some advantages and disadvantages, 6:25315 (CONF-810622—5)
Lyons, L.A., *See* Sellner, K.G., 6:26325
Lytle, J.M., *See* Marchant, D.D., 6:25654
Lyukov, V., *See* Ammar, R., 6:26504

M

Ma, E., Fun with W, Z, H, and G's, 6:26573
Radiative corrections in the standard model, 6:26540
See Barger, V., 6:26541
Maag, C.R., *See* Hoffman, A.R., 6:25287
MacCracken, M.C., Causes of CO_2-induced sensitivity in a zonal climate model, 6:26163 (UCRL—85754)
See Potter, G.L., 6:26108
MacDonald, A.H., Influence of relativistic contributions to the effective potential on the electronic structure of Pd and Pt, 6:25921
MacDonald, N.S., *See* Schelbert, H.R., 6:26310
MacFarlane, D., *See* Barish, B., 6:26517
MacKay, W., *See* Koester, L.J., 6:26499
MacLachlan, J., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Macpherson, M.D., National petroleum reserve - Alaska: marine transportation system analysis. Executive summary, 6:25048 (PB—81-105033)
National petroleum reserve - Alaska: marine transportation system analysis. Final report, 6:25049 (PB—81-105041)
Macriss, R.A., *See* Zawacki, T.S., 6:25724
Maeenpaeae, M., *See* Grimaldi, M.G., 6:25956
Magerl, A., *See* Wipf, H., 6:26608
Magnuson, J.J., *See* Rahel, F.J., 6:26380
Maguire, B. Jr., New paradigm for the examination of closed ecosystems, 6:26214
Some patterns in post-closure ecosystem dynamics (failure), 6:26225
Maguire, C.F., *See* Wells, J.C., 6:26586
Maguire, J., *See* Tsukamoto, O., 6:26027
Mahaffey, M.K., FFTF-containment air-cleaning system, 6:25509 (HEDL-SA—2105-FP)
Mahaffy, J.H., TRAC methods and models, 6:25528 (LA-UR—81-1498)
Mahagin, D.E., Breached-pin testing in the US, 6:25495 (HEDL-SA—2405-FP)
Mahoney, R.K., *See* Sellner, K.G., 6:26325
Mailen, J.C., *See* Pruett, D.J., 6:25100
Majka, R., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Makdisi, Y., *See* Berg, D., 6:26509
Makhlyueva, I., *See* Ammar, R., 6:26504
Maki, A.W., Evaluation of toxicant effects on structure and function of model stream communities: correlations with natural stream effects, 6:26394
Malanchuk, J.L., Microcosm evaluation of the agricultural potential of fly-ash-amended soils, 6:26203
Mallan, G.M., Americology Resource Recovery System, 6:25203 (ANL/CNSV-TM—60, pp 209-241)
Mallard, J.R., *See* Ettinger, K.V., 6:26085
Malloy, T.P., Effect of enhanced oil recovery chemicals on crude refining, 1979-1980, 6:25039 (DOE/BETC/IC—80/3(Vol.4), pp 13p, Paper 15)
Malmo, J., *See* Fjeld, S., 6:25253
Manasse, F.K., *See* Mathur, V.K., 6:24841
Mandler, J.W., In-plant source term measurements at Turkey Point Station - Units 3 and 4. Topical report, 6:25536 (NUREG/CR—1629)
Mangold, D.C., Computer program CCC: user's manual, 6:26475 (LBL—10909)
Mankin, C.J., *See* Bright, J.A., 6:24978
Mann, F.M., *See* Vogel, P., 6:25501
Mann, L.G., *See* Wilhelmy, J.B., 6:26589
Manowitz, B., Capabilities for research on acid rain, 6:26113 (BNL—29741)
Mansfield, D.K., Effects of passive isolation on several optically pumped far-infrared laser lines, 6:26040
Manuel, C.Y., Limitations on the use of microcosms for predicting algal response to nutrient enrichment in lotic systems, 6:26239
Manuel, K., Energy sense is common sense, 6:25786 (CONF-7910214—, pp vp, 24p)
Manz, O.E., *See* Groenewold, G.H., 6:24927
Marchal, P., Development of original water/steam heat pump for industrial applcations, 6:25779 (CONF-800272—, pp 241-254)
Marchant, D.D., Method of generating electricity using an endothermic coal gasifier and MHD generator, 6:25654
Marchant, L.C., US Department of Energy-Fossil Energy Laramie Energy Technology Center tar sand research and development program, FY 1980, 6:25081 (DOE/BETC/IC—80/3(Vol.1), pp 8p, Paper 29)
Marchin, L., *See* Crocker, M., 6:25047
Marchok, A.C., *See* Clark, J.N., 6:26304
Marcum, D.S., Affordable, earth sheltered, passive solar house, 6:25325 (CONF-800438—, pp 185-186)
Margolin, L.G., Calculations of cratering experiments with the bedded crack model, 6:25080 (LA-UR—81-1659)
Mariscotti, M.A.J., *See* Kreiner, A.J., 6:26585
Markiewicz, T.W., *See* Clark, A.R., 6:26500
Marks, M., *See* Osborn, W.C., 6:25329
Markuszewski, R., Evaluation of the removal of organic sulfur from coal, 6:24866 (IS-M—317)
See Chuang, K.C., 6:24867
Marley, S.J., *See* Claar, P.W. II, 6:25276, 6:25277
Marnell, P., Direct firing of coal-water suspensions: state-of-the-art review, 6:24965
Maroni, V.A., First-wall, blanket, and shield engineering test program for magnetically confined fusion power reactors, 6:26684 (CONF-801011—100)

Marrett, C.B., Accident at Three Mile Island and the problem of uncertainty, 6:25563
Marsh, F., *See* LaFontaine, G., 6:25293
Marsh, W., *See* Barish, B., 6:26517
Marshak, M., *See* Berg, D., 6:26509
Marshall, W.F., *See* Koehler, D.E., 6:25856
See Naman, T.M., 6:25859
Marston, K., *See* Trauth, C.A. Jr., 6:26403
Martin, F.D., Development of improved mobility control agents for surfactant/polymer flooding, 6:25018 (DOE/BETC/IC—80/3(Vol.2), pp 12p, Paper 19)
Martin, F.J., Operation of medium-speed diesel engines on blends of middle distillate SRCII with No. 2D oil, 6:25861 (DOE/BETC/IC—80/3(Vol.4), pp 3p, Paper 28)
Martin, F.P., Guide to the design of physical protection systems for light water reactors, 6:25173 (SAND—81-0586C)
Martin, G., *See* Foster-Pegg, R.W., 6:25442
Martin, J., Use of the ECL-CAMAC trigger processor system for recoil missing mass triggers at the Tagged Photon Spectrometer at Fermilab, 6:26077 (FERMILAB-Conf—81/40-EXP)
Martin, J.F., *See* Dankowych, J.A., 6:26492
Martin, J.L., *See* Chisholm, R.F., 6:25551
See Dohrenwend, B.P., 6:25553
Martin, J.W., Outlook for in situ gasification of eastern coal, 6:24897
Martin, M.M., *See* Senn, R.L., 6:25515
Martin, R.L., Argonne's program in heavy-ion fusion, 6:26668 (CONF-800740—28)
Economic 5-megajoule heavy-ion driver for mid-term fusion goals, 6:26685 (CONF-801011—101)
See Cohen, J.S., 6:26464
Martin, S.A., *See* Hay, D.W., 6:26001
Martinez, L., Broadcast radio system for distribution communications. Final report, 6:25477 (EPRI-EL—1868)
Martini, W.R., Computer simulation of the transient response of a 4 cylinder Stirling engine with burner and air preheater in a vehicle, 6:25875 (DOE/NASA/0226—1)
Martone, J.A., *See* Boubel, R.W., 6:25853
Maru, H., *See* Farooque, M., 6:25667
Marx, J.N., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Mason, C.F.V., Improved efficiency in the sulfur dioxide-iodine hydrogen cycle through the use of magnesium oxide, 6:25177 (LA-UR—81-1050)
Masson, L.S., *See* Jassby, D.L., 6:26705
Mast, T.S., *See* Muller, R.A., 6:26071
Master, H., *See* Hasselriis, F., 6:25827
Masuda, T., PUROX system demonstration test on simulated Japanese refuse, 6:25188
Mathur, V.K., Continuous two-stage solar-gasification system, 6:24841 (CONF-801104—16)
Matsuda, Y., Electron-cyclotron-resonant-heated electron distribution functions, 6:26645 (UCRL—85826)
Matsuno, K., *See* Shimamura, S., 6:25577
Mattas, R., *See* Abdou, M., 6:26681
See Baker, C.C., 6:26678
Mattas, R.F., *See* Smith, D.L., 6:26680
Maudlin, P.J., Differential sensitivity theory applied to movement of maxima responses, 6:25520 (CONF-810606—42)
Maw, R., Group solar housing, 6:25371
Maxfield, D.A., *See* Gardner, J.F., 6:24854, 6:24855
Maximon, L.C., *See* Lehman, D.R., 6:26731
Maxon, S., Analytic solution for a weakly rotating, collisionless z pinch, 6:26654
May, H., Ionizing radiation levels in energy conserving structures, 6:25610
Ionizing radiation levels in energy conserving structures, 6:26164 (CONF-800438—, pp 215-236)
Mayer, E.H., *See* Carmichael, J.D., 6:25005
Mayer, F.J., *See* Slater, D.C., 6:26662
Mayfield, M.W., *See* Robertson, R.C., 6:25396
Mayo, F.R., Oxidations of Illinois No. 6 coal at and below 60°C, 6:24910
Mazur, A., Three Mile Island and the scientific community, 6:25558
McAlister, A.J., Non-noble catalysts and catalyst supports for phosphoric-acid fuel cells. 2nd quarterly report, December 1980-February 1981, 6:25668 (DOE/NASA/6229—2)
McBeth, R.L., *See* Hayatsu, R., 6:24907, 6:24919
McCain, R., *See* Voegele, M., 6:26407
McCal, D., *See* Miller, M., 6:26483
McCann, R.A., *See* Wiles, L.E., 6:25572
McCarthy, J.S., *See* Minehart, R.C., 6:26491
McClellan, J.F., *See* Elliott, E.T., 6:26180
McClenahan, C.R., Operation of the new Hermes II Marx, 6:26710 (SAND—81-0750C)
McClintock, N.A., *See* Paige, W.A., 6:24893
McClung, J.D., *See* Martin, J.W., 6:24897
McColl, J., *See* Root, J., 6:26130
McColl, J.G., Acid precipitation and ecological effects in Northern California, 6:26127 (CONF-800365—, pp 122-123)
McConnell, J.W., *See* Dickens, J.K., 6:26600
McConville, G.T., Quadrupole interactions in liquid and solid deuterium, 6:25981 (MLM—2817(OP))
McCormick, C.L., *See* Neidlinger, H.H., 6:25028
McCormick, J.B., *See* Lynn, D.K., 6:25670
McCray, R.L., *See* Paige, W.A., 6:24893
McDearman, W.R., *See* Jamison, T.D., 6:25503
McDonald, J.R., A manual for the use of electrostatic precipitators to collect fly ash particles. Final report Dec 78-Feb 80, 6:25467 (PB—81-112757)
McDonald, W.J., Evaluation of equipment and methods to map lost circulation zones in geothermal wells, 6:25403 (SAND—80-7057)
McDowell, W.J., Recovery of aluminum and other metal values from fly ash, 6:24932
McDowell, W.P., *See* Keefe, D.J., 6:26076
McDowell-Boyer, L.M., *See* Kaye, S.V., 6:26192
McFadden, J.J., *See* Bruetsch, R.I., 6:25873
McFall, A.L., Summary of pressure coring developments, 6:24994 (DOE/BETC/IC—80/3(Vol.1), pp 12p, Paper 23)
See Heckes, A.A., 6:24987
McFarlane, G.A., *See* Franzin, W.G., 6:26366
McGhee, J.W., *See* Donaldson, E.C., 6:24979
McGowan, F.K., *See* Lee, I.Y., 6:26587
McIsaac, C.V., *See* Mandler, J.W., 6:25536
McIver, R.D., *See* Zielinski, R.E., 6:25067
McKenna, K.F., *See* Lipson, J., 6:26646
McKeown, R.D., Inclusive reactions of pions on nuclei, 6:26575
McKinley, B.M., *See* Cady, W.E., 6:25941
McKinney, B.G., Summary of discussion-group sessions on fly ash conditioning: coal firing, 6:25457 (EPRI-WS—80-127, pp 3.41-3.43)
See Altman, R.F., 6:25456
McKnight, C.E., Disposal of soluble salt waste from coal gasification, 6:24923 (AD-A—090419)
McKown, C., *See* Stewart, K.K., 6:25367
McLaughlin, D.B., *See* Arnett, R.C., 6:25135
McLaughlin, M., *See* Berg, D., 6:26509
McLean, R.A.N., *See* Tomlinson, G.H., 6:26133
McMillen, D.F., Coal structure cleavage mechanisms: scission of diphenylmethane and diphenyl ether linkages to hydroxylated rings, 6:24916
McNeil, R.I., *See* Cronauer, D.C., 6:24858
McNeill, D.H., Balmer alpha emission and hydrogen atom energy in ion-source discharges, 6:26703 (PPPL—1797)
McNutt, B., Impact of fuel-economy information on new-car and light-truck buyers, 6:25754 (DOE/CS/58840—T1)
McPherson, B., Hot water from the sun: a consumer guide to solar water heating, 6:25344 (HUD-PDR—548)
McVay, G.L., *See* Buckwalter, C.Q., 6:25134
See Porter, D.L., 6:25488
McWilliams, P.G., Physiology of fish in acid waters, 6:26360 (CONF-800365—, pp 282-283)
Meadows, B., *See* Abshire, G., 6:26498
Means, R.C., Preliminary analysis of the natural gas market-ordering problem, 6:25073 (UT/CES-PS—15)
Mears, D.R., Low temperature solar heating of greenhouses, 6:25355
See Cipolletti, J.P., 6:25356
See Roberts, W.J., 6:25729
Mecking, B.A., *See* Rock, S., 6:26511
Medenica, M., *See* Gaeke, M.E., 6:26305
Medine, A.J., Heavy-metal and nutrients effects on sediment oxygen demand in three-phase aquatic microcosms, 6:26224
Medley, S.S., *See* Persing, R., 6:26638
Meger, R.A., *See* Goldstein, S.A., 6:26444
Mehta, M., *See* Gvozdic, N., 6:26004
Meier, J.K., *See* Gilbert, J.S., 6:25530
Meisenheimer, R.G., *See* Holloway, P.H., 6:25247
Melcher, A.G., State energy modeling. Volume I. An analysis of state energy modeling, 6:25591 (DOE/CS/10046—2(Vol.1))
Melissinos, A.C., *See* Miller, M., 6:26483
Mello, P.A., *See* Brody, T.A., 6:26606

Meltz, G., Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments, 6:26437 (DOE/ER/10160—4)
Mende, S.B., *See* Heppner, J.P., 6:26440
Mendel, C.W., Theory of AMPFION class ion diodes, 6:26708 (SAND—81-0599C)
Mendillo, J.V., *See* Wilson, R.P. Jr., 6:25439
Menzel, D.W., Applying results derived from experimental microcosms to the study of natural pelagic marine ecosystems, 6:26241
Merkle, K.L., *See* King, W.E., 6:25919
Merlotti, C.L., *See* Gurney, M.D., 6:25885
Merriam, R.L., Solar heating and cooling (SHAC) simulation programs: assessment and evaluation. Volume 2. Detailed findings. Final report, 6:25343 (EPRI-EM—1866(Vol.2))
Meshii, M., *See* King, W.E., 6:25919
Messner, R., *See* Barish, B., 6:26517
Metcalf, R.L., *See* Cole, L.K., 6:26397
Metcalf, W., *See* Miller, M., 6:26483
Metcalfe, J.L., *See* Peterson, R.H., 6:26377
Mettee, H., Solar induced water splitting with p/n heterotype photochemical diodes: n-Fe_2O_3/p-GaP, 6:25266
Metz, D., Aesthetics of the underground building, 6:25694 (CONF-800438—, pp 18-21)
Metzler, R.M., *See* Venier, C.G., 6:24909
Meunier, Direct heat exchanger: Saturne recuperator, 6:25776 (CONF-800272—, pp 198-204)
Meyer, D.A., *See* Moore, T.L., 6:26713
Meyer, E.L., *See* Gipson, G.L., 6:26173
Meyer, G.L., Modeling and analyses to support EPA's low-level radioactive waste standards, 6:25107 (CONF-801217—, pp 9-19)
Overview of EPA's health risk assessment model for the shallow land disposal of LLW, 6:25167 (CONF-801217—, pp 283-301)
Meyer, J.E., Functional requirements for fusion reactor first walls. Status report No. MITNRL-002, 6:26692 (DOE/ER/10107—2)
Meyer-Schuetzmeister, L., *See* Holland, R.E., 6:26577
Meyers, P.D., *See* Clark, A.R., 6:26500
Meyers, R.E., Regional issue identification and assessment program (RIIA) Issue paper 2. Atmospheric long-range transport lead laboratory methodology, 6:26114 (BNL—51289)
Meyers, S., Department of Energy waste management program by the Office of Nuclear Waste Management, 6:25161
Micek, L., *See* Rudzki, J.E., 6:25226
Michaels, K., Cost projections for redox energy-storage systems. Final report, April 30, 1979-September 30, 1979, 6:25666 (DOE/NASA/0126—1)
Michel, J.W., *See* Domingo, N., 6:25313
Michel, P., *See* Habegger, L., 6:25229
Mick, C., Application of proactive behavioral techniques for the promotion of solar retrofit in condominiums: the Friars Village case study, 6:25327 (DOE/CS/10210—T1)
Mick, C.K., Handbook for the marketing of conservation and solar-energy programs, 6:25849 (DOE/CS/10210—T2)
Mick, U., *See* Mick, C., 6:25327
Mihursky, J.A., Chalk Point steam electric station studies Patuxent Estuary studies: ichthyoplankton population studies, 1979. Final report, 6:25465 (PB—81-111312)
Mikaelian, K.O., Pair production of intermediate vector bosons, 6:26556
Mikkelsen, A.R., *See* Tran, D.Q., 6:24872
Milburn, R., *See* Koester, L.J., 6:26499
Miles, J., Fabrication, testing, and modeling plans for a 125-kW counter-rotating-turbine wave energy converter, 6:25410 (SERI/TP—634-1215)
Millar, R.C., *See* Jackson, A.J., 6:25684
Miller, A.E., *See* Todd, A.M.M., 6:26639
Miller, C.A., *See* Benton, W.J., 6:25053
Miller, D.w., *See* Verardo, A.E., 6:25589
Miller, E.K., Direct time-domain techniques for transient radiation and scattering from wires, 6:26625
Miller, F.A., Design and performance of a full-scale spray calciner for nonradioactive high-level-waste-vitrification studies, 6:25132 (PNL—3742)
Miller, G.A., Elastic pion double charge exchange reactions, 6:26578
Miller, G.D., *See* Benson, D.A., 6:26614
Miller, H.D., Collection and retention of atmospheric pollutants by vegetation, 6:26333 (CONF-800365—, pp 33-40)
Miller, J.D., *See* Miller, H.D., 6:26333
Miller, J.E., *See* Irving, P.M., 6:26346
Miller, J.F., *See* Yao, N.P., 6:25584
Miller, M., Shadowing in muon-nucleus scattering, 6:26483
Miller, M.L., *See* Heppner, J.P., 6:26440
Miller, M.M., *See* Skogerboe, R.K., 6:24937
Miller, M.W., Assessment of health impacts from electrical-power transmission lines, 6:26401 (UR—3490-2024)
Miller, P.A., *See* Mendel, C.W., 6:26708
Miller, P.C., *See* Pollock, E.O., 6:25351
Miller, R.B., *See* Genoni, T.C., 6:26065
Miller, R.C., New transitions in the photoluminescence of GaAs quantum wells, 6:25955
Miller, R.G., Calibrated/guarded hot-box test facility, 6:25753
Miller, R.K., *See* Molton, P.M., 6:25284
Miller, R.L., Solvent effects on the hydroliquefaction of Wyodak coal, 6:24891
Miller, W., *See* Gaeke, M.E., 6:26305
Miller, W.G., *See* Butler, B.L., 6:25245
See Davis, H.T., 6:25025
Miller, W.M., Solid desiccant regeneration by direct solar energy for fresh fruit drying, 6:25357
Miller, W.O., Instrumentation for determining rock mass permeability by hydro-pneumatic pressure testing, 6:26415 (LBL—12076, pp 153-156)
Millican, G.A., Tester line voltage monitor, 6:25471 (BDX—613-2449)
Millikan, R.E., *See* Schindler, R.H., 6:26486
Minehart, R.C., Pion-deuteron elastic scattering for momenta from 408 to 600 MeV/c, 6:26491
Minning, C.P., *See* Garcia, A. III, 6:25278
Minor, R.C., Development of a quality-assurance program for the Tritium Systems Test Assembly, 6:26697 (LA-UR—81-1416)
Minshall, G.W., *See* Manuel, C.Y., 6:26239
Minturn, R.E., Annual cycle energy system, 6:25711 (CONF-810672—16)
Mischke, R.E., *See* Lockyer, N., 6:26502
Misra, B., *See* Baker, C.C., 6:26678
Mitchell, A.C., *See* Hawke, R.S., 6:26026
Mitchell, C.S., *See* Potter, G.L., 6:26108
Mitchell, K.W., *See* Balluffi, R.W., 6:25242
Mitchell, M.J., Use of microcosms in studying decomposition processes in sewage sludge, 6:26231
Mixon, F.O., *See* Nichols, D.G., 6:24940
Mlekodaj, R.L., *See* Bingham, C.R., 6:26592
Modine, F.A., *See* Jellison, G.E. Jr., 6:26438
Moerlein, S.M., Tricatecholamide analogs of enterobactin as Ga and In radiopharmaceuticals, 6:26005
Moerner, W.E., *See* Chraplyvy, A.R., 6:25929
Moffett, D.R., *See* Lockyer, N., 6:26502
Mohn, E., Regional surveys of the chemistry of small Norwegian lakes: a statistical analysis of the data from 1974 to 1978, 6:26258 (CONF-800365—, pp 234-235)
Moldan, B., Analysis of atmospheric precipitation in Czechoslovakia, 6:26128 (CONF-800365—, pp 124-125)
Moldauer, P.A., Neutron strength functions: the link between resolved resonances and the optical model, 6:26601 (CONF-800979—18)
Molin, A.A., *See* Panchenkov, G.M., 6:26002
Mollenkopf, H.C., *See* Hopkins, R.H., 6:25250
Molton, P.M., Effects of reaction conditions on the aqueous thermochemical conversion of biomass to oil, 6:25284
Molvik, A.W., Large-acceptance-angle gridded analyzers in an axial magnetic field, 6:26644 (UCRL—52981)
Momeni, M.H., *See* Rayno, D.R., 6:25163
Monahan, J.E., *See* Holland, R.E., 6:26577
Mondt, J.P., Finite Larmor radius theory of resistive instabilities, 6:26650
Mongon, A., Energy conservation in French industry and at Rhone-Poulenc, 6:25794 (CONF-7910214—, pp vp, 30p)
Moniz, E.J., Pauli blocking in the nuclear medium πN transition matrix, 6:26605
Mook, H.A., *See* Kamitakahara, W.A., 6:25930
Moon, R.B., *See* Frame, E.A., 6:25851
Moon, R.M., Magnetic properties of SmN, 6:25947
See Stassis, C., 6:25933
Moore, B. III, *See* Maguire, B. Jr., 6:26214
Moore, C., *See* Clark, A.R., 6:26500
Moore, C.F., *See* Morris, C.L., 6:26579
Moore, I.B., *See* Morris, C.L., 6:26579
Moore, L.P., *See* Hayatsu, R., 6:24907, 6:24919
Moore, T.L., Obtaining full operation for a large suite of neutral-beam injectors, 6:26713 (UCRL—86041)
Mooring, F.P., *See* Holland, R.E., 6:26577
Morehouse, J., *See* Noreen, D., 6:25328
Moreira, A.R., *See* Murphy, V.G., 6:25406

Moreland, W., Industrial heat pumps and their applications, 6:25778 (CONF-800272—, pp 216-240)
Moretto, L.G., Equilibrium statistical treatment of angular momenta associated with collective modes in fission and heavy-ion reactions, 6:26604
Experimental evidence and theoretical implications of fluctuations in deep inelastic heavy ion collisions, 6:26574 (LBL—12596)
Morgan, H.S., MARC calculations for the second WIPP structural benchmark problem, 6:25143 (SAND—81-0925)
Morgan, R.J., *See* Pruneda, C.O., 6:25942
Morneau, R.A., *See* Killian, E.W., 6:26080
Morosin, B., Crystallographic properties of lithium niobate shock-loaded from 3.7 to 20 GPa and preserved for post-shock study, 6:25952 (SAND—81-1315C)
Shock-induced inorganic chemistry, 6:25985 (SAND—81-1455C)
See Golden, J., 6:25984
See Venturini, E.L., 6:25937
Morowitz, H.J., *See* Maguire, B. Jr., 6:26214
Morris, C.L., Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca, 6:26579
Morris, G., *See* Abshire, G., 6:26498
Morris, J.W. Jr., *See* Wu, I.h., 6:25957
Morris, W.L., Remaining fatigue lifetime prediction for retirement-for-cause in aluminum alloys, 6:25906 (IS-M—315)
Morrison, B., *See* Harriman, R., 6:26280
See Wright, R.F., 6:26264
Morrison, D.E., *See* Unseld, C.T., 6:25603
Morrison, E.L., Alternate frequency analysis for the solar power system, 6:25295 (DOE/ER/10160—T5)
Morrison, P.J., Hamiltonian field description of the one-dimensional Poisson-Vlasov equations, 6:26640 (PPPL—1788)
Morrison, S.R., *See* Frese, K.W. Jr., 6:25954
Morrow, N.R., Entrapment and mobilization of residual oil, 6:24986 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 12)
Morrow, P.E., Aerosol factors affecting respiratory deposition, 6:26392 (UR—3490-2026)
Morse, O., *See* Verderber, R.R., 6:25841
Morse, W.M., *See* Schmidt, M.P., 6:26560
Morton, J.E., *See* Warholic, G.R., 6:24906, 6:24935
Mosello, R., Chemical characteristics and buffer capacity of fifty alpine lakes (Italy, Pennine-Lepontine Alps), 6:26259 (CONF-800365—, pp 236-237)
Moskowitz, B., *See* Miller, M., 6:26483
Moss, M., Thermal conductivity of polyhalite and anhydrite from the site of the proposed waste isolation pilot plant, 6:26430 (SAND—81-0856)
Moss, T.H., Three Mile Island nuclear accident: lessons and implications, 6:25539
Moulton, D.S., *See* Shearer, J.A., 6:24956
Moyer, R.A., *See* Poe, W.L., 6:25124
Mroz, G.D., *See* Sajdak, R.L., 6:25281
Mueller, B., *See* Reinhardt, J., 6:26466
Mueller, C.A., *See* Malanchuk, J.L., 6:26203
Mugge, M., *See* Clark, A.R., 6:26500
Mujahid, A., Diffuse sky measurements and determination of corrected shadow band multiplication factors, 6:25228
Mukherjee, S., *See* Benton, W.J., 6:25053
Mulac, A.J., *See* Donaldson, A.B., 6:25035
Mulera, T.A., *See* Zarbakhsh, F., 6:26488
Mulik, P.R., *See* DeCorso, S.M., 6:25440
Mullendore, A.W., *See* Pierson, H.O., 6:25938
Muller, R.A., Mass spectrometry with a very small cyclotron, 6:26071 (LBL—12797)
Mumma, S., *See* Burgess, H., 6:25733
Mundahl, N.D., *See* Kraft, K.J., 6:26288
Mundy, J.N., *See* Bussmann, W., 6:25918
Munger, J.W., *See* Eisenreich, S.J., 6:26182
Muniz, I.P., Acidification: effects on freshwater fish, 6:26339 (CONF-800365—, pp 84-92)
Toxic effects of aluminum on the brown trout, Salmo trutta L., 6:26373 (CONF-800365—, pp 320-321)
See Leivestad, H., 6:26372
See Rosseland, B.O., 6:26381
See Sevaldrud, I.H., 6:26385
Munnecke, D.M., In situ microbial enhancement of oil production by biopolymer or biosurfactant production or selective plugging, 6:24991 (DOE/BETC/IC—80/3(Vol.1), pp 13p, Paper 17)
Munteanu, O., *See* Miller, R.C., 6:25955
Munzert, K.H., *See* Reiter, R., 6:26143
Murphy, H.M. Jr, *See* Cohen, A.E., 6:26100
Murphy, P.G., Response of a forest ecotone to ionizing radiation. Progress report, October 15, 1980-October 14, 1981, 6:26315 (DOE/EV/02283—2)
Murphy, V.G., Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw, 6:25406 (DOE/ID/12051—T1)
Murr, L.E., Interfacial phenomena in solar materials, 6:25236 (CONF-8006156—, pp 35-54)
See Holloway, P.H., 6:25247
See Homhual, C., 6:25384
See Inal, O.T., 6:25385
Murray, J.G., *See* Vogel, H.F., 6:26633
Murray, R.C., Impact of the January-February 1980 earthquake sequence on various structures at the Lawrence Livermore National Laboratory, 6:25171 (UCRL—85460)
Murray, W.B., Shared responsibilities of the utility and the media in crisis situations, 6:25549
Murtha, M.J., Assessment of the environmental impact of power plant fly ash, 6:24933 (IS-M—309)
See Burnet, G., 6:24929
Myal, F.R., Waterflood residual oil saturation technology test in a semi-consolidated sandstone reservoir, 6:24982 (DOE/BETC/IC—80/3(Vol.1), pp 13p, Paper 7)
Myers, H., Representing the congress, 6:25548
Myers, T.D., *See* Weinstein, K.D., 6:25044
Myhre, T.C., *See* Northcutt, W.G. Jr., 6:25917
Myles, K.M., *See* Shearer, J.A., 6:24956
See Smyk, E.B., 6:24955

N

Nader, L., Energy choices in a democratic society. Supporting paper 7, 6:25602 (PB—81-114852)
Nagamoto, T.T., *See* Gerber, E.W., 6:25099
Nagarajan, R., *See* Klaus, E.E., 6:25021
Nagle, D.E., *See* Lockyer, N., 6:26502
Nahui, A., *See* Pierson, H.O., 6:25219
Naman, T.M., Automotive fuel economy: potential improvement through selected differential gear lubricants, 6:25857 (DOE/BETC/IC—80/3(Vol.4), pp 8p, Paper 18)
Automotive fuel economy: potential improvement through selected engine lubricants, 6:25858 (DOE/BETC/IC—80/3(Vol.4), pp 10p, Paper 19)
Emissions characteristics of light-duty diesel vehicles, 6:25859 (DOE/BETC/IC—80/3(Vol.4), pp 8p, Paper 22)
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4), pp 8p, Paper 20)
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4), pp 9p, Paper 21)
Naphtali, L.M., *See* Farber, G., 6:24865
Narasimhan, T.N., Interpretation of a hydraulic fracturing experiment, Monticello, South Carolina, 6:26431
See Kanehiro, B.Y., 6:26414
Nash, T., *See* Martin, J., 6:26077
Nath, N.R., *See* Heppner, J.P., 6:26440
Navrotsky, A., *See* Henry, D.J., 6:26427
Ne'eman, Y., Internal supersymmetry and unification, 6:26571
Sequential internal supersymmetry, 6:26562
Nealey, S.M., *See* Greene, M.R., 6:25131
Neame, P.A., Oxygen uptake and production in sediment-water microcosms, 6:26223
Neau, E.L., PBFA I performance monitoring and evaluation system (PMES), 6:26711 (SAND—81-0751C)
Neidlinger, H.H., Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2), pp 14p, Paper 29)
Neil, V.K., Theoretical investigation of a 10-μm free-electron laser amplifier using a 50-MeV multi-kA electron beam, 6:26033 (UCRL—85653)
Nelkin, D., Pregnant pause: the European response to the Three Mile Island accident, 6:25555
Nelson, C.A. Jr., *See* Berg, D., 6:26509
Nelson, D.A., *See* Hartley, J.N., 6:25133
Nelson, D.M., Measurements of the oxidation state and concentration of plutonium in interstitial waters of the Irish Sea, 6:26291 (CONF-801063—6)
Nelson, E.V., Survey of EPA facilities for solar thermal energy applications. Final report 1 Nov 77-30 Jun 78, 6:25643 (PB—81-109316)
Nelson, L.P., Distillate shale oil/diesel engine operating compatibility,

6:25795 (DOE/BETC/IC—80/3(Vol.4), pp 11p, Paper 30)
Nelson, M.E., *See* Schindler, R.H., 6:26486
Nelson, R.G., The economic and environmental structure of Alabama's coastal region, part II. Environmental structure, 6:25601 (PB—81-113391)
See Nissan, E., 6:26160
Nelson, S.O., *See* Bluhm, D.D., 6:24948
Nelson, T.A., *See* Murray, R.C., 6:25171
Nemeth, D.M., Resouce recovery option in solid-waste management: a review guide for public officials , 6:25839 (DOE/CS/20156—T1)
Nemethy, P., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Nesbitt, D.M., Energy/economic model analysis. Energy economic modeling system. Final report, 6:25597 (PB—81-114274)
Neta, P., *See* Battacharyya, S.N., 6:26003
Neumann, H.J., *See* Randall, J.M., 6:25817
Neuzil, C.E., Measurement of in-situ hydraulic conductivity in the Cretaceous Pierre Shale, 6:26412 (LBL—12076, pp 96-102)
Nevins, W.M., *See* Matsuda, Y., 6:26645
Newby, R.A., *See* Keairns, D.L., 6:24939
See Ulerich, N.H., 6:25445
Newcomb, W.A., *See* Pearlstein, L.D., 6:26657
Newman, C.G., *See* Giraudi, R.V., 6:25259
Newman, J.O., *See* Simmons, J.D., 6:25743
Newsom, C.R., *See* Bhatia, T.S., 6:26576
Newton, J.O., Observation of giant dipole resonances built on states of high energy and spin, 6:26588
Newton, R.A., *See* Rudnicki, M.I., 6:25078
Neyeloff, S., Performance of a CFR engine burning simulated anaerobic digester's gas, 6:25893
Ng, D.S., *See* Murray, R.C., 6:25171
Ngan, Y., *See* Warholic, G.R., 6:24906, 6:24935
Nguyen, Q.C., *See* Ross, D.S., 6:24881
Niarchos, D., *See* Cashion, J.D., 6:25896
Niccum, M., Three possible alternate energy schemes consistent with the geologic environment of the Snake River Plain, 6:25391
Volcanic and seismic hazards on the eastern Snake River Plain, Idaho, 6:26422
Niccum, MM., *See* Cline, K.M., 6:26424
Nicholls, J.A., Initiation of detonation in unconfined natural gas-air clouds. Final report, 6:25071 (PB—81-113292)
Nichols, D.G., Pollutants from synthetic fuels production: environmental evaluation of coal gasification screening tests. Final report Aug 78-Jul 79, 6:24940 (PB—81-114308)
Nicholson, I.A., Continuous monitoring of airborne pollutants, 6:26137 (CONF-800365—, pp 144-145)
Effects of a Scots pine (Pinus sylvestris L.) canopy on the chemical composition and deposition pattern of precipitation, 6:26138 (CONF-800365—, pp 148-149)
pH and sulphate content of precipitation over Northern Britain, 6:26136 (CONF-800365—, pp 142-143)
See Fowler, D., 6:26341
Nicolet, M., *See* Grimaldi, M.G., 6:25956
Nieman, H.D., *See* Gardner, J.F., 6:24855
Niemann, B., *See* Root, J., 6:26130
Nilsson, I., *See* Farrell, E.P., 6:26186
Nissan, E., Waste disposal inventory for Mississippi-Alabama coastal counties, 6:26160 (PB—81-118994)
Nixon, K.V., Remote detection system, 6:26078 (LA—8814-MS)
Nixon, S.W., Turbulent mixing in aquatic microcosms, 6:26244
See Pilson, M.E.Q., 6:26240, 6:26242
Njoes, A., *See* Christophersen, N., 6:26205
Noceti, R.P., *See* Bockrath, B.C., 6:24874
Noe, N.D., *See* Gibbs, L.L., 6:26061
Noguchi, Y., *See* Shimamura, S., 6:25577
Noll, L.A., *See* Good, W.D., 6:25059
Nordyke, M., Why you see what you see looking down at an underground explosion, 6:26102 (UCID—19031)
Noreen, D., Comparison of conventional and solar-water-heating products and industries report, 6:25328 (DOE/CS/30217—T1)
Norem, J.H., In-situ maintenance of low-Z limiters in reactors, 6:26683 (CONF-801011—99)
Norman, G.T., *See* Simon, R.L., 6:25418
North, W.J., Biomass production by freshwater and marine macrophytes, 6:25283
Northcliffe, L.C., *See* Bhatia, T.S., 6:26576
Northcutt, K.J., *See* Dyer, F.F., 6:25965
Northcutt, W.G. Jr., Effect of titanium content and aging temperature on the properties of uranium-titanium alloys, 6:25916 (Y/DV—73)
Hydrogen content and strain rate effects on the tensile properties of a uranium-titanium alloy, 6:25917 (Y/DV—74)
Norton, S.A., Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. I. Sediment dating and chemical stratigraphy, 6:26271 (CONF-800365—, pp 268-269)
See Davis, R.B., 6:26274
Norton, W.R., *See* Arnett, R.C., 6:25135
Norwood, F.R., *See* Hicks, D.L., 6:26062
Novakov, T., Soot in urban atmospheres, 6:26148 (LBL—10881)
Novendstern, E.H., *See* Garner, D.C., 6:25490
Novikoff, D., *See* Barish, B., 6:26517
Novil, M., *See* Jerger, D.E., 6:25194
Nowak, G., *See* Ammar, R., 6:26504
Nutt, G.L., Calibration of peizoresistive gauges, 6:26092 (UCRL—86285)
Nyborg, M., Soil acidification by SO_2 emissions in Alberta, Canada, 6:26141 (CONF-800365—, pp 180-181)

O

O'Connell, J.P., *See* Shah, D.O., 6:25023
O'Connell, L.G., Future possibilities for energy-storage automobiles, 6:25881 (UCRL—85902)
O'Donnell, T.P., Low-cost, efficient and durable low-temperature solar collector, 6:25386
O'Guinn, D.W., *See* Glass, N.R., 6:26123
O'Hare, G.A., ADVCON APT postprocessor, 6:26016 (BDX—613-2635)
PTTOPT APT postprocessor, 6:26015 (BDX—613-2634)
O'Hare, M., *See* Bar-Cohen, A., 6:25722
O'Malley, C., Further education and training, 6:25848 (CONF-7910214—, pp vp, 9p)
O'Rear, D.J., *See* Sullivan, R.F., 6:24863
Odom, A.L., A characterization of faults in the Appalachian foldbelt, 6:26416 (NUREG/CR—1621)
Oekland, J., Environment and snails (Gastropoda): studies of 1000 lakes in Norway, 6:26374 (CONF-800365—, pp 322-323)
pH level and food organisms for fish: studies of 1000 lakes in Norway, 6:26376 (CONF-800365—, pp 326-327)
Oekland, K.A., Mussels and crustaceans: studies of 1000 lakes in Norway, 6:26375 (CONF-800365—, pp 324-325)
See Oekland, J., 6:26376
Ogden, J.G. III, Comparative composition of continential and Nova Scotian precipitation, 6:26129 (CONF-800365—, pp 126-127)
Ogden, S.B., *See* Ho, P.C., 6:25033
Ogier, W.C., *See* McMillen, D.F., 6:24916
Ogner, G., Effects of acid precipitation on soil and forest. 10. The effect of growth of Norway spruce on soil acidity by acid irrigation, 6:26357 (CONF-800365—, pp 208-209)
Ohanian, M.J., *See* Tesar, D., 6:25499
Ohanian, R., Shelterra earth homes structural shell and other general observations, 6:25701 (CONF-800438—, pp 101-125)
Ohshima, T., *See* Berg, D., 6:26509
Okabayashi, M., *See* Todd, A.M.M., 6:26639
Okada, J.T., Cross-borehole seismic probing for petroleum reservoir assessment, 6:24972 (DOE/BETC/IC—80/3(Vol.1), pp 2p, Paper 10)
Oldham, L.P., Second-generation heliostat development. Volume 1. Detailed design report, 6:25307 (SAND—79-8192/1)
Olness, J.W., *See* Haustein, P.E., 6:26583
Olsen, C.S., Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region, 6:25522 (CONF-810801—3(Summ.))
Olson, D.A., *See* Green, H.J., 6:25320
Olson, E.S., HPLC and phase transfer catalysis in the analysis of oxidation products of lignite liquids and model compounds, 6:24912
Olson, M.M., *See* Sellner, K.G., 6:26325
Olson, R.E., Collisional processes of interest in MFE plasma research. Progress report No. 4, April 1, 1981-May 31, 1981, 6:26631 (DOE/ET/53025—T8)
Olszewski, M., Use of low-grade reject heat, 6:25618
Utilization of reject heat, 6:25617
Olszewski, R.J., *See* Dohrenwend, R.E., 6:26120
Oman, D.B., *See* Nesbitt, D.M., 6:25597
Ondrusek, P.S., *See* Danielson, H.H., 6:25011
Onischak, M., *See* Rush, W.F. Jr, 6:24938
Oostens, J., *See* Zarbakhsh, F., 6:26488
Opresko, D.M., *See* Talmage, S.S., 6:26323
Orel, A.E., *See* Kulander, K.C., 6:25999
Orphan, R.C., *See* Knox, J.B., 6:26161
Osborn, A.G., *See* Good, W.D., 6:25058
Osborn, W.C., State incentives for passive solar commercialization, 6:25329 (DOE/CS/30245—T1)

Osborne, M.F., Sorption of iodine on low-chromium-alloy steel, 6:25484 (CONF-810606—52)
Osbourn, G.C., *See* Wiczer, J.J., 6:26089
Oscar, K.J., Effects of low power microwaves on the local cerebral blood flow of conscious rats, 6:26398 (AD-A—090426)
Oscarson, H.G., *See* Henrikson, L., 6:26371
Othmer, P.W., *See* Sowell, E.F., 6:25338
Ott, K.O., Fast Breeder Blanket Facility (FBBF). Annual report, January 1, 1980-December 31, 1980, 6:25497 (PNE—81-149)
Ott, W.R., Brownian-motion model of pollutant-concentration distributions. Study on statistics and environmental factors in health (SIMS), 6:26145 (DOE/EV/10428—11)
Ottinger, P.F., *See* Goldstein, S.A., 6:26444
Otto, C., *See* Friberg, F., 6:26367
Otvos, J.W., *See* Mettee, H., 6:25266
Ouellet, M., *See* Jones, H.G., 6:26255
Overbeek, R., *See* Wos, L., 6:26626
Overly, P.T., *See* Nelson, E.V., 6:25643
Overton, J.B., *See* Bostick, W.D., 6:25196
Oviatt, C.A., *See* Pilson, M.E.Q., 6:26242
Ovrut, B.A., Decoupling theorems and effective field theories, 6:26542
Owen, D.P., *See* Yager, P.M., 6:26487
Owen, P.S., Resource consequences of reenrichment versus blending, 6:25500 (HEDL-SA—2322-FP)
Owens, J.W., *See* Gladney, E.S., 6:26432
Oxley, J.H., Potential of colloidal fuels in future energy usage, 6:24966

P

Paffrath, L., *See* Logg, C.A., 6:26090
Page, G.C., *See* Lewis, D.S., 6:24936
Paglieri, J.N., *See* Brown, C.L., 6:25513
Pagni, P.J., *See* Beier, R.A., 6:26011
Paige, W.A., Status of the COGAS process: ICGG coal gasification demonstration plant project, 6:24893
Paine, B.M., *See* Grimaldi, M.G., 6:25956
Pakonen, T., *See* Huttunen, S., 6:26345
Pakvasa, S., *See* Barger, V., 6:26544
Palazzo, D.F., Coal to gasoline via Mobil MTG technology, 6:24896
Palen, W.A., *See* Narasimhan, T.N., 6:26431
Panchenkov, G.M., Radiation stability of azo dyes in aqueous solutions, 6:26002 (DP-TR—19)
Pande, S., *See* Zoghbi, S.S., 6:26306
Pandey, A., *See* Brody, T.A., 6:26606
Pang, C.Y., *See* Schindler, R.H., 6:26486
Papadimitriou, L., Heterojunction solar cells on cuprous oxide, 6:25272
Park, R.L., *See* Brodsky, M.B., 6:25244
Park, Y.K., *See* Byer, R.L., 6:26036
Parke, W.C., *See* Lehman, D.R., 6:26731
Parker, F.L., Significant issues in water resources policy, 6:26299
Parker, N.R., Inventory of emissions from boating sources in California. Final report, 6:26152 (PB—81-111460)
Parker, R.W., *See* Nyborg, M., 6:26141
Parker, W.S., Application of trommeling to prepared fuels, 6:26055 (ANL/CNSV-TM—60, pp 101-116)
Parkinson, B.A., *See* Kline, G., 6:25268
Parks, C.C., *See* Rehn, V., 6:25983
Parks, C.V., *See* Maudlin, P.J., 6:25520
Paschmann, G., *See* Forbes, T.G., 6:26439
See Sckopke, N., 6:26441
Patel, K.M., *See* Baltisberger, R.J., 6:24914
Patel, P.M., *See* Dankowych, J.A., 6:26492
Paterson, I.S., *See* Fowler, D., 6:26341
See Nicholson, I.A., 6:26136, 6:26137, 6:26138
Paton, D.L., Techniques for assessing the wind energy resource in the Great Lakes region, 6:25415 (PNL—3668)
Patrick, J.F., *See* Schindler, R.H., 6:26486
Patrinos, A.A., Power plant induced rainfall modification: Fact or fiction?, 6:26170
Patrylak, A.J., *See* Chatterjee, N., 6:24862
Patterson, E.L., Characterization of an accelerator designed to study electron-beam uniformity in large diodes, 6:26072 (SAND—81-0844C)
Patterson, J.A., Near-term market conditions, 6:25104
Paul, M., *See* Henning, W., 6:26070
See McKeown, R.D., 6:26575
Paulling, J.R., Theory and user manual for OTEC C. W. pipe programs ROTECF and SEGPIP, 6:25317 (DOE/NOAA/OTEC—35)
Paulson, D.N., *See* Allen, P.C., 6:26624
Pavelka, L.A., *See* Mayo, F.R., 6:24910
Pawlicki, A.J., *See* Dankowych, J.A., 6:26492
Payne, J.R., *See* Dorward, R.C., 6:25796
Payne, M.G., *See* Hurst, G.S., 6:26451
Paynter, W.T., *See* Danielson, H.H., 6:25011
Pearlstein, L.D., Analytic equilibria with quadrupole symmetry in the paraxial limit, 6:26657
Pedersen, L.D., Energy conservation in the canning industry, 6:25814
Peelgren, M.L., *See* Leibowitz, L.P., 6:25310
Peercy, P.S., *See* Follstaedt, D.M., 6:25928
Pehl, R.H., *See* Walton, J.T., 6:26079
Peirce, J.J., *See* Vesilind, P.A., 6:26056
Peishel, F.L., *See* Hill, A.J. Jr., 6:26317
Pelanne, C.M., Does the insulation have a thermal conductivity. The revised ASTM test standards require an answer, 6:25749
Light transmission measurements through glass fiber insulations, 6:25688
Penney, T., *See* Miles, J., 6:25410
Pepper, D.W., Dispersion of radioactive pollutant in a tornadic storm, 6:26165 (DP—1556)
Perez, M., *See* Baird, C.D., 6:25359
Perez, R.B., *See* de Saussure, G., 6:26597, 6:26598
Perez-Mendez, V., *See* Zarbakhsh, F., 6:26488
Peritz, L.A., *See* Schroeder, R.L., 6:26057
Perl, M.L., *See* Schindler, R.H., 6:26486
Perlman, D., *See* Cain, W.S., 6:26400
Perlmutter, S., Montana Geothermal Handbook: a guide to agencies, regulations, permits and financial aids for geothermal development, 6:25392 (DOE/ID/12014—T1)
Perrin, D.R., *See* Gladney, E.S., 6:26432
Perrine, E.L., *See* Miller, R.G., 6:25753
Perrot, F., Energetics of hydrogen in aluminum, 6:25923
Perry, E.S., *See* Sellner, K.G., 6:26325
Persing, R., Microchannel plate response to high-energy neutrons, 6:26638 (PPPL—1773)
Peters, N., *See* Troutman, D., 6:26269
Peters, N.E., *See* Galloway, J.N., 6:26270
Peters, P., *See* Campbell, J.H., 6:25087
Peters, W.A., *See* Franklin, H.D., 6:24879
See Howard, J.B., 6:24860
Peterson, D.R., *See* Hawke, R.S., 6:26026
Peterson, D.T., *See* Kamitakahara, W.A., 6:25930
Peterson, E., *See* Berg, D., 6:26509
Peterson, L.F., *See* Germer, J.H., 6:25504
Peterson, N.L., *See* Liou, K.Y., 6:25935
Peterson, R.H., Effects of low pH on hatching of Atlantic salmon eggs, 6:26377 (CONF-800365—, pp 328)
Petrick, M., MHD Heat and Seed Recovery Technology Project. Eleventh quarterly report, July-September 1980, 6:25645 (ANL/MHD—80-19)
Pettigrew, D.R., *See* Schindler, J.E., 6:26219
See Waide, J.B., 6:26220
Pettitt, R.A., Development of man-made geothermal reservoirs, 6:25399 (LA-UR—81-852)
Petty, J.A., Cropped-Pin Transfer System for the Fuels and Materials Examination Facility, 6:25511 (HEDL-SA—2300)
Phelps, M.E., *See* Schelbert, H.R., 6:26310
See Wisenberg, G., 6:26309
Philippacopoulos, A.J., Evaluation of the simultaneous action of earthquake, LOCA and SRV on Mark-III containment and drywell structures, 6:25517 (BNL—29358)
Phillips, J.A., *See* Burkhardt, L.C., 6:26694
Phillips, R.J.N., *See* Barger, V., 6:26527, 6:26535
Phillips, S.J., Verification of partially saturated zone moisture migration: model and field facilities, 6:25113 (CONF-801217—, pp 139-154)
Pi, S., Suppression of superheavy magnetic monopoles in grand unified theories, 6:26546
Pick, E., Operation characteristics of a utility-free dwelling in Kansas, 6:25363
Pickering, K.E., Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)
Picologlou, B.F., US/USSR joint MHD generator testing at the U-25 MHD pilot plant, 6:25649 (CONF-800806—43)
Pidgeon, W.M., *See* Bruetsch, R.I., 6:25873
Piepho, M.G., Continuous-release formulation for environmental doses to moving receptors, 6:26166 (HEDL-SA—2302)
See Cady, K.B., 6:25526
Piercey, R.B., *See* Wells, J.C., 6:26586
Piersma, H., *See* Jansen, L.A., 6:25803
Pierson, E.S., Liquid-metal MHD for solar and coal, 6:25646 (CONF-800617—8)
Liquid-metal MHD for solar and coal: system and component status, 6:25648 (CONF-800806—42)

Pierson, H.O., Chemical vapor deposition of TiB_2 from diborane, 6:25938
Development of solar energy in Peru, 6:25219 (SAND—81-0764)
Pillard, Energy recovery from industrial and vegetable wastes, 6:25774 (CONF-800272—, pp 176-184)
Pillsbury, P.W., *See* DeCorso, S.M., 6:25440
Pilson, M.E.Q., Annual nutrient cycles in a marine microcosm, 6:26242
Marine microcosms in ecological research, 6:26240
See Nixon, S.W., 6:26244
Pinko, L., *See* Chrost, L., 6:26362
Pitt, R.E., *See* Yager, P.M., 6:26487
Pittard, G., *See* McDonald, W.J., 6:25403
Pitukhin, P., *See* Ammar, R., 6:26504
Pitzer, K.S., Phase equilibria for highly unsymmetrical plasmas and electrolytes, 6:26480
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Plato, C., Advantages of the hydrasposal process as applied to the Hempstead Resources Recovery Plant and the Dade County Solid Waste Recovery Plant, 6:25830 (ANL/CNSV-TM—60, pp 347-363)
Platts, D.A., 10-joule high-voltage trigger micro Marx, 6:26699 (LA-UR—81-1641)
Pleimann, L.G., *See* Andre, J., 6:25748
Plumb, R.L., Development of an automated project tracking system for the Bartlesville Energy Technology Center, 6:26716 (DOE/BETC/IC—80/3(Vol.4), pp 5p, Paper 31)
Plummer, J.L., Policy implications of energy vulnerability, 6:25634
Pochapsky, T.C., *See* Burke, F.P., 6:25972
Podolski, W.F., *See* Smyk, E.B., 6:24955
Poe, W.L., Environmental analysis burial of offsite low-level waste at SRP, 6:25124 (DPST—80-466)
Poenitz, W.P., Data interpretation, objective evaluation procedures and mathematical techniques for the evaluation of energy-dependent ratio, shape and cross section data, 6:26596 (CONF-800979—19)
Poggi, G., *See* Awes, T.C., 6:26599
Pohl, L.E., Design criteria and candidate concept for high-performance cold trap, 6:25491 (DOE/SF/00893—T4)
Poirier, J.L., Proceedings of second Franco-American conference on industrial energy conservation, 6:25763 (CONF-800272—)
See Bailly, H.C., 6:25780
Polasek, J.C., *See* Bullin, J.A., 6:26159
Policastro, A.J., Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume I. Dispersion from single and multiple source natural draft cooling towers. Technical report, 6:25459 (NUREG/CR—1581-V-1)
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 2. Salt drift deposition from natural draft cooling towers. Technical report, 6:25460 (NUREG/CR—1581-V-2)
Pollak, M., *See* Nelkin, D., 6:25555
Pollock, D.W., Conceptual analysis of the groundwater flow system at the Maxey Flats radioactive waste burial site, Fleming County, Kentucky, 6:25115 (CONF-801217—, pp 197-213)
Pollock, E.O., Performance of passive-solar space-heating systems. Comparative report, 1979-1980 heating season, 6:25351 (SOLAR/0022—81/39)
Pomerantz, S.M., *See* Malanchuk, J.L., 6:26203
Pomeroy, B.D., Alternative configurations for sodium-cooled solar thermal power plants, 6:25312
Pongratz, M.B., *See* Heppner, J.P., 6:26440
Pope, G.A., Mobility control and scaleup for chemical flooding, 6:25029 (DOE/BETC/IC—80/3(Vol.2), pp 23p, Paper 30)
Popovic, B., Acidification effect of urea and sulfur application on the forest soil in a percolation experiment, 6:26185 (CONF-800365—, pp 182-183)
Popowicz, A.M., $^{12}C/^{13}C$ and H/D vapor pressure isotope effects of fluoroform: intermolecular interactions in liquid fluoroform, 6:26452 (DOE/ER/10612—3)
Porcella, D.B., *See* Medine, A.J., 6:26224
Porter, D.L., Response to annealing and reirradiation of AISI 304L stainless steel following initial high-dose neutron irradiation in EBR-II, 6:25488 (CONF-800609—17)
Porter, F.C., Measurement of inclusive eta production in e^+e^- interactions near charm threshold, 6:26508
Portnoff, M.R., Speech processing based on short-time Fourier analysis, 6:26729 (UCRL—86104)
Post, D.E., *See* Grisham, L.R., 6:26704
Poster, R., *See* Jensen, D.A., 6:26505
Potter, G.L., Climate change and cloud feedback: The possible radiative effects of latitudinal redistribution, 6:26108
Potter, J.M., *See* Lockyer, N., 6:26502
Potts, W.T.W., *See* McWilliams, P.G., 6:26360
Poulit, J., Energy savings: a competitive hedge, 6:25673 (CONF-800272—, pp 6-16)
Pouska, G., *See* Surkalo, H., 6:25015
Powell, C.J., *See* Holloway, P.H., 6:25247
Powell, G.L., *See* Northcutt, W.G. Jr., 6:25917
Powell, J.A., *See* Chikalla, T.D., 6:25130
Powell, J.R., Potential role of district heating in the US, 6:25834 (BNL—29282)
See Karkheck, J.P., 6:25621
Powers, C.F., *See* Glass, N.R., 6:26123
Poyser, T.D., Study to improve transmission system availability and utilization through identification of critical parameters and transformer performance analysis. Final technical report, 6:25472 (DOE/ET/29356—6)
Pozharova, E., *See* Ammar, R., 6:26504
Pramanik, D., Spectral selectivity of conducting micromeshes, 6:25388
Prater, R., *See* Turner, L.R., 6:26676
Prater, R.L., Raman scattering studies of the impurity-induced ferroelectric phase transition in $KTaO_3$:Li, 6:25958
Pratt, H., *See* Voegele, M., 6:26407
Prentice, J.D., *See* Dankowych, J.A., 6:26492
Price, D.L., Pulsed neutron sources for condensed-matter research, 6:25175 (CONF-801111—45)
Price, H., *See* Goldburg, A., 6:24983
Price, R.J., Strength of nonuniformly oxidized PGX graphite, 6:25948 (GA-A—16270)
Price, W., *See* Voelker, J., 6:25639
Priedhorsky, W., Epoxy replication for Wolter x-ray microscope fabrication, 6:26636 (LA-UR—81-1611)
Pringle, W., Analysis of the chemistry associated with ozonolysis of organic pollutant molecules in water, 6:24942 (PB—81-115651)
Probert, S.D., *See* Thirst, T.J., 6:25751
Pronko, P.P., Pulsed laser mixing of Ni-Au surface films on nickel substrates, 6:25895 (CONF-801124—50)
Prosnitz, D., *See* Neil, V.K., 6:26033
Prudic, D.E., Computer simulation of groundwater flow at a commercial radioactive-waste landfill near West Valley, Cattaraugus County, New York, 6:25116 (CONF-801217—, pp 215-248)
Pruett, D.J., Removal of fluoride from aqueous nitric acid, 6:25100 (ORNL/TM—7502)
Pruneda, C.O., Structure-property relations of Kevlar 49 fibers, 6:25942 (UCRL—85744)
Pudovkina, Z.V., Zirconolite and its crystallographic characteristics, 6:25989 (LA-tr—81-10)
Pummer, H., *See* Egger, H., 6:26037
Pung, T.C., Internal-standard method for multi-element neutron activation analysis of airborne particulates in Taiwan, 6:25974
Puri, V.M., *See* Dale, A.C., 6:25354
Purohit, M., *See* Barish, B., 6:26517
Pyatenko, Yu. A., *See* Pudovkina, Z.V., 6:25989
Pyle, R.V., *See* Berkner, K.H., 6:26454

Q

Quezel, S., *See* Burlet, P., 6:25963
Quigg, C., Inverse scattering and the Y family, 6:26550
Quincy, E.A., Statistical model fitting of remote induction sounding data from underground coal gasification site--Hanna II, phases 2 and 3, 6:24885
Quintenz, J.P., *See* Mendel, C.W., 6:26708
Quirk, T., *See* Koester, L.J., 6:26499
Qutubuddin, S., *See* Benton, W.J., 6:25053
Qvenild, C., *See* Dahl, J.B., 6:26183
Qvenlid, C., *See* Christophersen, N., 6:26205

R

Raaen, V.F., *See* Benjamin, B.M., 6:24908
Rabin, M.S.Z., *See* Jensen, D.A., 6:26505
Rabinowitz, J., *See* Kydes, A.S., 6:25595
Rabl, V., *See* Voelker, J., 6:25639

Rabo, J.A., COthane, methane from waste CO. Final technical report, 6:25182 (DOE/CS/40177—T2)
Racine, W.C., Feasibility of geothermal heat use in the San Bernardino Municipal Wastewater Treatment Plant. Final report, September 1980-June 1981, 6:25408 (DOE/SF/11442—T1)
Radding, S.B., *See* Jones, J.L., 6:25183
Raddum, G.G., Comparison of benthic invertebrates in lakes with different acidity, 6:26378 (CONF-800365—, pp 330-331)
Phytoplankton and zooplankton in acidified lakes in South Norway, 6:26379 (CONF-800365—, pp 332-333)
Radics, C., *See* Boyd, D.W., 6:25279
Radke, C.J., Enhanced recovery with mobility and reactive tension agents, 6:25022 (DOE/BETC/IC—80/3(Vol.2), pp 24p, Paper 23)
Radmer, R., Photochemistry and enzymology of photosynthesis. Progress report, November 1, 1978-May 31, 1981, 6:26308 (DOE/ER/03326—101)
Radosevich, L.G., Thermal energy storage for solar thermal applications program. Progress report, April 1980-March 1981, 6:25580 (SAND—81-8225)
Raghaven, R., *See* Soliman, M., 6:25034
Rahel, F.J., Fish in naturally acidic lakes of northern Wisconsin, USA, 6:26380 (CONF-800365—, pp 334-335)
Rahman, M.M., *See* Quincy, E.A., 6:24885
Rahnke, C.J., *See* Fucinari, C.A., 6:25862
Rai-Choudhury, P., *See* Hopkins, R.H., 6:25250
Raible, C.J., *See* Gall, B.L., 6:24998
See Jennings, J.B., 6:24999
See Volk, L.J., 6:24997
Raja, R., *See* Koester, L.J., 6:26499
Rajeswaran, G., *See* Rajkanan, K., 6:25269
Rajkanan, K., Loss mechanism analysis in single-crystal and polycrystalline silicon MIS solar cells to produce 13% efficiency, 6:25269
See Singh, R., 6:25267
Rakel, D.A., Gamma-ray measurements for simultaneous calorimetric assay, 6:25969 (MLM—2840(OP))
Raley, J.H., Oil shale project run summary, small retort runs S-21 and S-23, 6:25086 (UCID—19082)
Raman, S., *See* Gilai, D., 6:25507
Ramayya, A.V., *See* Wells, J.C., 6:26586
Rambaek, J.P., *See* Hanssen, J.E., 6:26124
Rambo, D.L., *See* Glass, N.R., 6:26123
Ramey, H.J. Jr., Drawdown and build-up type curve for interference testing, 6:25402 (LBL—12076, pp 130-134)
Ramirez, J.J., *See* Patterson, E.L., 6:26072
Randall, C.M., Measurements of typical insolation variation at Daggett, California. Volume I. Methodology and sample data, 6:25224 (ATR—80(7747)-1(Vol.1))
Measurements of typical insolation variation at Daggett, California. Volume II. Appendices including data sets, 6:25225 (ATR—80(7747)-1(Vol.2))
Randall, J.M., Energy reduction in beet sugar processing by cossette liming, 6:25817
Randich, E., Low temperature chemical vapor deposition of TaB_2, 6:25939
Ransome, R.D., *See* Bhatia, T.S., 6:26576
Rao, V.D.N., *See* Fucinari, C.A., 6:25862
Rapidis, P., *See* Barish, B., 6:26517
Rapier, P.M., Multi-stage flash degaser, 6:25397
Rasmussen, N.C., Methods of hazard analysis and nuclear safety engineering, 6:25542
Rasmussen, N.E., *See* Jarvinen, P.O., 6:25578
Rasolt, M., *See* Perrot, F., 6:25923
Ratigan, J.L., Modeling of static mining subsidence in a nonlinear medium, 6:24934 (LBL—11896)
Ratto, J.J., *See* Heredy, L.A., 6:24876
Rausch, D.A., *See* Wahle, H.W., 6:25761
Ray, R.M., *See* Donaldson, E.C., 6:24979
Ray, S., *See* Hay, D.W., 6:26001
Ray, W. Jr., *See* Holland, R.E., 6:26577
Raychaudhuri, K., *See* Jensen, D.A., 6:26505
Raymond, K.N., *See* Moerlein, S.M., 6:26005
Rayno, D.R., Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
Read, W.A., *See* Stamm, M.E., 6:26029
Rebsdorf, A., Acidification of Danish soft-water lakes, 6:26204 (CONF-800365—, pp 238-239)
Reddy, J.F., *See* Lander, G.H., 6:25962
Redfield, D., Evaluation and verification of epitaxial process sequence for silicon solar-cell production. Quarterly report No. 1, 6:25251 (DOE/JPL/955825—81/1)
Method for evaluation of antireflection coatings, 6:25270
Photovoltaic mechanisms in polycrystalline thin-film silicon solar cells. Quarterly report No. 6, November 1, 1980-January 31, 1981, 6:25249 (DOE/ET/23108—7)
Redwine, R.P., *See* McKeown, R.D., 6:26575
Reed, S.A., Coupling technology for dual-purpose central station power plants, 6:25620
Use of heat from dual-purpose central station for desalting applications, 6:25622
Reed, T.B., Biomass densification energy requirements, 6:25206
Reed, T.N., Metafile for efficient sequential and random display of graphics, 6:26720 (LA-UR—80-3642)
Rees, J., *See* Harte, J., 6:26216
Regan, C., *See* Ettinger, K.V., 6:26085
Rehak, P., *See* Abshire, G., 6:26498
Rehbein, D.K., *See* Schmidt, F.A., 6:25905
Rehm, B.W., *See* Groenewold, G.H., 6:24927
Rehn, V., Chemical makeup of Nb and Nb_3Sn films, 6:25983 (SAND—81-0969C)
Reich, M., *See* Philippacopoulos, A.J., 6:25517
Reid, R.O., Impact of government incentives on the market for energy-saving technologies in the US industrial sector, 6:25781 (CONF-800272—, pp 276-287)
Reifenberger, R., *See* Balluffi, R.W., 6:25242
Reilly, J.P., Spark discharge characteristics of vehicles energized by ac electric fields, 6:25869 (PB—81-114720)
Reiners, W.A., *See* Cronan, C.S., 6:26343
Reinhardt, J., Theory of positron production in heavy-ion collisions, 6:26466
Reinke, D., *See* deNoyelles, F. Jr., 6:26233
Reis, E.E., *See* Sweig, R.A., 6:26693
Reiter, R., Balance of the tropospheric ozone and its relation to stratospheric intrusions indicated by cosmogenic radionuclides. Technical progress report, November 1, 1980-June 30, 1981, 6:26143 (DOE/ET/03425—21)
Remer, J., *See* Doe, T., 6:26410
Ressl, R.A., *See* Isa cs, G.A., 6:24952
Rest, J., *See* Smith, D.L., 6:26675
Reuter, R.C. Jr., Torque ripple in a Darrieus, vertical axis wind turbine, 6:25433
Rey, C.A., *See* Cason, N.M., 6:26493
Reyes, J., *See* Furtak, T.E., 6:26473
Reynolds, J.W., Application of the BETC re-refining technology to some state-of-the-art commercial lube oils, 6:25046 (DOE/BETC/RI—81/1)
See Brinkman, D.W., 6:25043
See Sutterfield, F.D., 6:24900
Reynolds, R.C. Jr., *See* Cronan, C.S., 6:26343
Rhoades, M.L., *See* Quincy, E.A., 6:24885
Rhodes, C.K., *See* Egger, H., 6:26037
Rhorer, R.L., Ultraprecision machining of optics at Los Alamos, 6:26021 (LA-UR—81-1962)
Rice, L.H., *See* Gerber, E.W., 6:25099
Rice, R.E., Extended development of a sodium hydroxide thermal-energy storage module, 6:25579 (DOE/NASA/0138—1)
Rich, J.W., Vibrational energy-transfer kinetics in molecular disequilibrium. Progress report, 6:25978 (DOE/ER/10458—2)
Richards, P., *See* Zoghbi, S.S., 6:26306
Richards, R.R., *See* Appelman, E.H., 6:25176
Richey, G., *See* Derosiers, R., 6:25185
Richmond, J.H., *See* Quincy, E.A., 6:24885
Richter, B., *See* Schindler, R.H., 6:26486
Rickard, W.H., *See* Fitzner, R.E., 6:26177
Rickert, P.G., Americium migration in basalt and implications to repository risk analysis, 6:25164 (CONF-8010130—8)
Rickles, R.N., Environmental impact assessment guidelines for new source coal gasification facilities. Interim report (final), 6:24941 (PB—81-114555)
Riedinger, L.L., *See* Bingham, C.R., 6:26592
Rieke, H.H., *See* Liebenthal, A.M., 6:25072
Rieke, H.H. III, Evaluation of gas-bearing coal seams, 6:25070
Rieke, R.D., Studies on unusually reactive metal powders. Preparation on new organometallic and organic compounds including potential new catalysts. Progress report, July 1, 1980-March 15, 1981, 6:25991 (DOE/ER/10603—1)
Riemer, R., *See* Ammar, R., 6:26504

Rightmire, C.T., *See* Rieke, H.H. III, 6:25070
Riley, P.J., *See* Bhatia, T.S., 6:26576
Rinker, G.A., *See* Borie, E., 6:26455
Rippon, J.E., Hydrogen, sulphur and nitrogen budgets in soils and catchments, 6:26275 (CONF-800365—, pp 276-277)
Risch, A.P., *See* Rabo, J.A., 6:25182
Riseman, S.M., Normalizing infrared FT photoacoustic spectra of solids, 6:25960
Ritchie, R.H., *See* Echenique, P.M., 6:26616
Rizzo, T.G., Can there be low intermediate mass scales in grand unified theories?, 6:26570
Roberts, A., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Roberts, J.A., *See* Knapp, F.F., 6:26311
Roberts, L.J., Socioeconomic impacts of time-of-day pricing by electric utilities: a case study of Philadelphia residential customers, 6:25637 (BNL—51326)
Roberts, P.C., Energy and value, 6:25600 (ORAU/IEA—81-5(M))
Roberts, W.J., Progress in movable blanket insulation systems for greenhouses, 6:25729
See Cipolletti, J.P., 6:25356
See Mears, D.R., 6:25355
Robertson, J.B., Modeling in low-level radioactive waste management from the US Geological Survey perspective, 6:25108 (CONF-801217—, pp 21-30)
Robertson, R.C., Water-related constraints to the development of geothermal electric generating stations, 6:25396 (ORNL/TM—7718)
Robinette, M.S., Geophysical techniques for selection, analysis and monitoring of waste disposal sites, 6:25160
Robinson, G.D. Jr., *See* Wisenberg, G., 6:26309
Robinson, L.H., *See* Wada, R.Y., 6:26154
Robinson, P.H., *See* D'Aiello, R.V., 6:25263
Robinson, R.L., *See* Wells, J.C., 6:26586
Robinson, S.L., *See* Hoover, W.R., 6:25178
Robl, T.L., *See* Vyas, K.C., 6:25084
Rocco, M., *See* Ecock, E.J., 6:25446
Roche, M.F., *See* Tomczuk, Z., 6:25587
Rock, S., Measurement of the elastic electron-neutron cross section at high Q^2, 6:26511
Roderick, N.F., *See* Hussey, T.W., 6:26660
Rodgers, E.B., Effects of elevated temperatures on macroinvertebrate populations in the Browns Ferry experimental ecosystems, 6:26329
Rodgers, J.H., *See* Dillon, C.R., 6:25466
Rodgers, J.H. Jr., Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238
Roeske, F., Radiation-to-light converters for nuclear environments: near-infrared emitters, 6:26083 (UCRL—85604)
Rogers, J.D., *See* Weldon, D., 6:26695
Rogers, L.E., *See* Fitzner, R.E., 6:26177
Rogozen, M., *See* Tobin, R.L., 6:24945
Rohatgi, A., Properties of polycrystalline silicon solar cells with controlled titanium additions, 6:25274
See Hopkins, R.H., 6:25250
Rolshoven, H., Economic and technical facts and developments in the field of energy in German industry, 6:25715 (CONF-7910214—, pp vp, 16p)
Romanowski, L.J. Jr., *See* Fahy, L.J., 6:25082
Romanowski, T.A., *See* Lockyer, N., 6:26502
Root, J., Map of areas potentially sensitive to wet and dry acid deposition in the United States, 6:26130 (CONF-800365—, pp 128-129)
Roscoe, B.A., Identification of noise in linear data sets by factor analysis, 6:25966 (DOE/EV/10403—2)
Rose, W.W., *See* Pedersen, L.D., 6:25814
Rosemarin, C.S., *See* Robertson, R.C., 6:25396
Rosen, S.P., Nonleptonic decays of charmed mesons. Part 1. Remarks on the differing lifetimes of charmed mesons, 6:26435
Nonleptonic decays of charmed mesons. Part 2. Tests for the pole model in exclusive and semi-inclusive decays of the D^0-meson, 6:26557
Nonleptonic decays of charmed mesons. Part 3. Tests of isospin selection rules in exclusive and semi-inclusive decays of charged D-mesons, 6:26558
Rosenau, J.R., *See* Schwartzberg, H.G., 6:25358
Rosenberg, R.A., *See* Rehn, V., 6:25983
Rosenbladt, R., *See* Ammar, R., 6:26504
Rosenqvist, I. Th., Importance of natural H^+ production for acidity in soil and water, 6:26260 (CONF-800365—, pp 240-241)
Roskies, R., *See* Bender, C.M., 6:26528, 6:26567
Rosner, D.E., *See* Stearns, C.A., 6:26010
Rosner, J.L., Magnetic moments of quarks in baryons and mesons, 6:26510
See Quigg, C., 6:26550
Ross, D.S., Conversion of bituminous coal in CO/H_2O systems II-pH dependence, 6:24881
See McMillen, D.F., 6:24916
Ross, J.F., Gasohol by direct extraction of aqueous ferments. Interim progress report No. 1, 6:25191 (DOE/AF/92003—1)
Ross, P.N. Jr., Characteristics of an NH_3-air fuel cell system for vehicular applications, 6:25671 (LBL—12754)
Rossat-Mignod, J., *See* Burlet, P., 6:25963
Rosseland, B.O., Physiological responses to acid water in fish. 2. Effects of acid water on metabolism and gill ventilation in brown trout, Salmo trutta L., and brook trout, Salvelinus fontinalis Mitchill, 6:26384 (CONF-800365—, pp 348-349)
Studies on freshwater fish populations: effects of acidification on reproduction, population structure, growth and food selection, 6:26381 (CONF-800365—, pp 336-337)
See Leivestad, H., 6:26372
Rosselet, L., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Rossignuolo, A.A., *See* Ang, P.G.P., 6:25261
Rothman, A.C., Generalized mixing angles in gauge theories with natural flavor conservation, 6:26524
Rothwarf, A., CdS/Cu_2S solar cell: basic operation and anomalous effects, 6:25286
Controlling influence of the Cu/sub 2/S optical absorption coefficient on the short-circuit currents of cu/sub 2/S/CdS solar cells, 6:25273
Rotter, M.D., *See* Roeske, F., 6:26083
Roussarie, A., Two-photon results from SPEAR, 6:26512
See Schindler, R.H., 6:26486
Roussin, R.W., *See* Santoro, R.T., 6:26702
Rovang, J.W., *See* Baltisberger, R.J., 6:24914
Rowley, J.D., *See* Gaeke, M.E., 6:26305
Rowny, P.E, *See* Rice, R.E., 6:25579
Roxey, T.E., *See* Schneider, R.T., 6:26453
Roy, G.D., Development and heat transfer analysis of direct coal-fired MHD combustors, 6:25650 (DOE/ET/10815—T4)
Roy, R.L., Owner-builder and the underground: building a low-cost home, 6:25699 (CONF-800438—, pp 64-71)
Ruberto, R.G., *See* Cronauer, D.C., 6:24858
Rubin, D.M., What the president's commission learned about the media, 6:25545
Rubinov, A.N., *See* Bushuk, B.A., 6:25995
Ruby, J.D., *See* Huettenhain, H., 6:24954
Ruchti, R.C., *See* Cason, N.M., 6:26493
Rucker, E., *See* McNutt, B., 6:25754
Ruddick, K., *See* Berg, D., 6:26509
Rudnicki, M.I., Study of gelled LNG, 6:25078 (DOE/TIC—11452)
Rudzki, J.E., Solar-meteorological research program for the South-Central US, 6:25226
See Wolff, W.J., 6:25227
Rue, R.L., *See* Thorsen, G.W., 6:25702
Ruegg, K.J., *See* Boekema, C., 6:25950
Rueslatten, H., *See* Rosenqvist, I. Th., 6:26260
Ruggiero, A.G., *See* Takayama, K., 6:26075
Ruhe, J.R., *See* Rhorer, R.L., 6:26021
Ruhter, W.D., Portable computer to reduce gamma-ray spectra for plutonium isotopic ratios, 6:25174 (UCRL—53145)
Rumsey, T.M., *See* Pedersen, L.D., 6:25814
Rush, C.M., *See* Meltz, G., 6:26437
Rush, W.F. Jr, High-temperature high-pressure particulate removal in coal gasification. Final report 1 Sep 78-1 Jan 80, 6:24938 (PB—81-113664)
Russell, C.T., *See* Forbes, T.G., 6:26439
See Sckopke, N., 6:26441
Russell, J.A., *See* Molton, P.M., 6:25284
Russo, R.C., *See* Skogerboe, R.K., 6:24937
Rye, R.R., *See* Kelber, J.A., 6:26459

S

Sabau, C., *See* Rayno, D.R., 6:25163
Sacarto, D.M., Geothermal policy project. Quarterly report, November 1, 1979-January 31, 1980, 6:25407 (DOE/SF/01795—T2)
Sadana, D.K., *See* Grimaldi, M.G., 6:25956
Sadler, K., *See* Brown, D.J.A., 6:26359

Sadowski, G.S., Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)
Saegebarth, E., *See* Harte, J., 6:26216
Sagle, A.L., *See* Zarbakhsh, F., 6:26488
Saha, S., *See* Haustein, P.E., 6:26583
Sahota, M.S., *See* Gilbert, J.S., 6:25530
Sajdak, R.L., Forest biomass for energy: a perspective, 6:25281
Salemme, R.M., *See* Pomeroy, B.D., 6:25312
Salman, O.A., Luminescence characteristics of 3-hydroxyflavone as a function of pressure and viscosity, 6:26457
Salomaa, M.K., *See* Enge, H.A., 6:26593
Sammells, A.F., *See* Ang, P.G.P., 6:25261
Sample, D.G., Design and use of density gauges for fossil-energy processes, 6:24873 (SAND—81-1347C)
See Thomas, M.G., 6:24883
Sandberg, R.O., *See* Davis, W.K., 6:25822
Sanders, S.J., *See* McKeown, R.D., 6:26575
Sanderson, C.G., DOE-OES-EML quality assurance program, 6:26168
Sandhu, H.S., *See* Smith, S.B., 6:26132
Sands, M.D., *See* Sullivan, S.M., 6:25319
Sandweiss, J., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Santanam, C., *See* Chang, R., 6:26295
Santini, D.J., Indirect benefits of cogeneration district heating, 6:25624
Santoro, R.T., Analysis of the ORNL radiation-streaming integral experiments, 6:26629 (CONF-810606—40)
FLUNG: coupled 35-group neutron and 21-group gamma ray, P_3 cross sections for fusion applications, 6:26702 (ORNL/TM—7828)
See Lillie, R.A., 6:26630
Santos, F.D., Strong j-dependent effects in (^{7}Li, ^{6}Li) reactions, 6:26582
Santschi, P.H., *See* Alder, D., 6:26290
Sard, R., *See* Koester, L.J., 6:26499
Satija, S.K., *See* Wipf, H., 6:26608
Sato, N., Multiterminal hvdc system representation in a transient stability program, 6:25480
Sau, R., The decomposition of N_2O on Ni(110). Technical report, 6:26110 (AD-A—090552)
Saukkola, P., *See* Jaakkola, S., 6:26347
Savage, G.M., *See* Trezek, G.J., 6:25201
Savery, C.W., *See* Cernansky, N.P., 6:25874
Savin, S.J., *See* Hamilton, G., 6:25730
Savrick, M.D., Engineering design of a solvent treatment/distillation used lubricating oil re-refinery, 6:25045 (DOE/BETC/IC—80/3(Vol.4), pp 4p, Paper 14)
Sawyer, P.J., Pilot attempt to grow winter flounders commercially. Completion report 15 Feb 77-30 Jun 80, 6:26327 (PB—81-119273)
Sayer, R.O., *See* Wells, J.C., 6:26586
Sayre, W.W., State-of-the-art in modeling solute and sediment transport in rivers, 6:26286 (CONF-801217—, pp 249-271)
Scamehorn, J.F., Optimum surfactant systems for oil recovery, 6:25030 (DOE/BETC/IC—80/3(Vol.2), pp 9p, Paper 31)
Scanio, J.J.G., Phase transitions and bounds on Higgs-boson masses, 6:26569
Scaroni, A.W., Kinetics of lignite pyrolysis in an entrained-flow, isothermal furnace, 6:24886
Schaefer, G.P., Industrial development of biomass energy sources, 6:25644
Schaeffer, J.E., *See* Aman, G.M. III, 6:25630
Schakenbach, J.T., *See* Pickering, K.E., 6:25413
See Zabransky, J., 6:25416
Schaplowsky, R.K., *See* Rudnicki, M.I., 6:25078
Scharre, D.L., Radiative transitions from the psi(3095) and psi'(3684) to ordinary hadrons, 6:26514
See Schindler, R.H., 6:26486
Schaug, J., *See* Joranger, E., 6:26126
Schechter, R.S., Tertiary oil recovery processes research at the University of Texas. Final report, October 1979-September 1980, 6:24974 (DOE/BC/20001—10)
See Scamehorn, J.F., 6:25030
Scheider, W.A., *See* Dillon, P.J., 6:26249
Scheingraber, H., *See* Egger, H., 6:26037
Schelbert, H.R., N-13 ammonia as an indicator of myocardial blood flow, 6:26310
See Wisenberg, G., 6:26309
Schenter, G.K., *See* Vogel, P., 6:25501
Schenter, R.E., *See* Vogel, P., 6:25501
Scheppele, S.E., *See* Dooley, J.E., 6:25056
Schiefelbein, G.F., Thermochemical conversion of biomass to fuels and feedstocks: an overview of R & D activities funded by the Department of Energy, 6:25290
Schier, W., *See* Enge, H.A., 6:26593
Schiffer, J.P., *See* McKeown, R.D., 6:26575
Schiller, S.R., Dynamic modeling and experimental simulation of active solar energy systems for the evaluation of control strategies, 6:25360
Schindler, D.W., Experimental acidification of a whole lake: a test of the oligotrophication hypothesis, 6:26206 (CONF-800365—, pp 370-374)
Schindler, J.E., Microcosm approach to the study of biogeochemical systems. I. Theoretical rationale, 6:26219
See Waide, J.B., 6:26220
Schindler, R.E., Process verification testing for burning TBP-containing organic solvents in the NWCF, 6:25125 (ENICO—1086)
Schindler, R.H., Measurements of the properties of D-meson decays, 6:26486
Schindwolf, R., Frequency response analysis of fluid control systems for parabolic-trough solar collectors, 6:25387
Schirber, J.E., Pressure dependence of the Fermi surface of hcp Yb, 6:25924
See Kwak, J.F., 6:25959
Schissel, L.A., *See* Schindler, J.E., 6:26219
See Waide, J.B., 6:26220
Schissel, P., *See* Butler, B.L., 6:25245
Schiz, A., High-statistics study of π^+ p, π^- p, and pp elastic scattering at 200 GeV/c, 6:26484
See Fajardo, L.A., 6:26485
Schmid, B.K., *See* Jackson, D.M., 6:24895
Schmidt, F.A., Preparation of high-purity silicon using thermite reactions. Final report, October 1, 1979-November 30, 1980, 6:25905 (IS—4762)
See Tsai, C.L., 6:25922
Schmidt, I.A., *See* Rock, S., 6:26511
Schmidt, M.P., Experimental constraints on models of CP violation, 6:26560
Schmidt, T.E., *See* Squires, T.G., 6:24911
Schmuckler, G., *See* Gjerde, D.T., 6:25977
Schneider, B.I., Direct calculation of resonance energies and widths using an R-matrix approach, 6:26463
Schneider, P.J., *See* Berkner, K.H., 6:26454
Schneider, R.T., Generation and identification of UIII lines. Annual report, 6:26453 (DOE/ET/33066—2)
Schneider, S.J., *See* Wenglarz, R.A., 6:25443
Schnitzer, H.J., *See* Ovrut, B.A., 6:26542
Schofield, C.L., *See* Baker, J.P., 6:26361
See Galloway, J.N., 6:26267, 6:26270
See Wright, R.F., 6:26285
Scholz, C., Time-dependent transmissivity of joints. Progress report, July 1, 1980-June 30, 1981, 6:26425 (DOE/ER/04054—5)
Schreiner, F., *See* Appelman, E.H., 6:25176
Schreiner, S.P., Use of microcosms in the study of habitat changes caused by the growth and perturbation of a water hyacinth community, 6:26232
See Schindler, J.E., 6:26219
See Waide, J.B., 6:26220
Schrider, L.A., *See* Martin, J.W., 6:24897
Schrimpff, E., Relationship between relief and deposition of some organic and inorganic contaminants in snow of northern Bavaria, F.R.G., 6:26131 (CONF-800365—, pp 130-131)
Schroeder, R.J., *See* Slater, D.C., 6:26662
Schroeder, R.L., Raytheon Service Company experience and programs in resource recovery, 6:26057 (ANL/CNSV-TM—60, pp 165-208)
Schroeder, T.A., Techniques for assessing the wind energy resource in Hawaii and Pacific Islands region, 6:25419 (PNL—3673)
Schubert, J.P., Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Schueck, C., *See* Newton, J.O., 6:26588
Schuller, R.M., *See* Griffin, R.A., 6:24930
Schulze, R.L., *See* Crisman, T.L., 6:26363
Schuresko, D.D., *See* Griffin, G.D., 6:26389
Schwartzberg, H.G., Use of solar concentrated brines for food processing, 6:25358
Schwarz, W.J., *See* Doe, T.W., 6:26404
Schwitters, R.F., *See* Schindler, R.H., 6:26486
Sciammarella, C., *See* Kupperman, D.S., 6:25934
Sciulli, F., *See* Barish, B., 6:26517
Sckopke, N., Structure of the low-latitude boundary layer, 6:26441
See Forbes, T.G., 6:26439
Scott, D.A., Testing multilayer printed wiring board prepreg by differential-scanning calorimetry. Final report, 6:26049 (BDX—613-2626)
Scott, D.M., *See* Halzen, F., 6:26536
Scott, J., *See* Gallagher, A., 6:25264
Scott, J.P., *See* Wilson, T.D., 6:25031, 6:25032

Scott, R.G., *See* Hayatsu, R., 6:24907, 6:24919
Scott, R.M., *See* Dyer, F.F., 6:25965
Scriven, L.E., *See* Davis, H.T., 6:25025
Seabaugh, P.W., *See* Agarwal, A.K., 6:24869
Sealock, L.J. Jr., *See* Schiefelbein, G.F., 6:25290
Sears, P.L., *See* Stangeby, P.C., 6:24884
Sedlet, J., Radionuclides in liquid effluents from Argonne National Laboratory: an example of monitoring for a multidisciplinary nuclear laboratory, 6:26292
Seefeldt, W.B., *See* Steindler, M.J., 6:25166
Seeley, F.G., *See* McDowell, W.J., 6:24932
Seery, D.J., *See* Freihaut, J.D., 6:24880
Seestrom-Morris, S.J., *See* Morris, C.L., 6:26579
Segall, B., *See* Hambourger, P.D., 6:25951
Segel, R.E., *See* McKeown, R.D., 6:26575
Segler, S., *See* Barish, B., 6:26517
Seidel, D.B., *See* Mendel, C.W., 6:26708
Seidl, P.A., *See* Morris, C.L., 6:26579
Seip, H.M., Acidification of freshwater: sources and mechanisms, 6:26284 (CONF-800365—, pp 358-366)
See Christophersen, N., 6:26205
See Dahl, J.B., 6:26183
Seitz, M.G., Groundwater-stream-simulation experiments for the evaluation of the safety of proposed nuclear waste repositories, 6:25120 (CONF-810722—1)
Seizinger, D.E., *See* Naman, T.M., 6:25859
Sekot, J.P., *See* Jassby, D.L., 6:26705
Selin, C., *See* Schelbert, H.R., 6:26310
Selin, C.E., *See* Wisenberg, G., 6:26309
Sellner, K.G., Phytoplankton studies and nutrient concentrations in the vicinity of the C. P. Crane Generating Station. Final report Jul 79 to Mar 80, 6:26325 (PB—81-114746)
Semb, A., *See* Dovland, H., 6:26115
See Hanssen, J.E., 6:26124
See Joranger, E., 6:26126
Semet, A., *See* Mansfield, D.K., 6:26040
Senjanovic, G., *See* Rizzo, T.G., 6:26570
Senn, R.L., Irradiation testing of miniature fuel plates for the RERTR program, 6:25515 (ORNL/TM—7761)
Sepaniak, M.J., Coal classification by HPLC and three-dimensional detection, 6:24913
Seraphin, B.O., *See* Booth, D.C., 6:25376
Serio, M.A., *See* Howard, J.B., 6:24860
Serpette, M., French industry and the energy conservation challenge, 6:25789 (CONF-7910214—, pp vp, 26p)
Serreze, H.B., *See* Squillante, M.R., 6:25257
Sersen, S.J., *See* Pollock, E.O., 6:25351
Seshan, K., *See* Pronko, P.P., 6:25895
Sessoms, A., *See* Koester, L.J., 6:26499
Setchell, R.E., Sandia 25-meter compressed helium/air gun, 6:26046 (SAND—81-1477C)
Setzler-Hamilton, E.M., *See* Mihursky, J.A., 6:25465
Sevaldrud, I., *See* Drabloes, D., 6:26201, 6:26386
See Rosseland, B.O., 6:26381
Sevaldrud, I.H., Loss of fish populations in Southern Norway. Dynamics and magnitude of the problem, 6:26385 (CONF-800365—, pp 350-351)
Sevgen, A., *See* Moniz, E.J., 6:26605
Shabazian, E., *See* Dankowych, J.A., 6:26492
Shaevitz, M., *See* Barish, B., 6:26517
Shafer, R.E., *See* Clark, A.R., 6:26500
Shah, D.O., Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2), pp 15p, Paper 24)
See Chou, S.I., 6:25994
Shaing, K., Effects of the fast wave on the drift-cyclotron loss-cone mode, 6:26653
Interaction of lower hybrid wave fields with drift-cyclotron loss-cone instability, 6:26652
Shaner, J.W., *See* Hawke, R.S., 6:26026
Shapiro, S.M., *See* Wipf, H., 6:26608
Sharanguivel, J., *See* Miller, M., 6:26483
Sharitz, R.R., *See* Murphy, P.G., 6:26315
Sharp, C.L., *See* Stoker, G.C., 6:26723
Sharp, D.H., *See* Bender, C.M., 6:26528, 6:26567
Sharp, J.M., Support services on the enhanced oil recovery field test program, 6:25016 (DOE/BETC/IC—80/3(Vol.2), pp 13p, Paper 17)
Sharp, W.E., *See* Shyn, T.W., 6:26465
Shatynski, S.R., *See* Brodsky, M.B., 6:25244
Shaw, R.S., *See* Feinberg, B., 6:26658
Shaw, R.W., Simple optoacoustic energy meter for pulsed lasers, 6:26032 (CONF-810630—6)
Shearer, J.A., Hydration of spent limestone and dolomite to enhance sulfation in fluidized-bed combustion, 6:24956 (CONF-800806—45)
Sheffield, J., Status of the tokamak program, 6:26701 (ORNL/TM—7778)
Sheffield, S.A., *See* Bloomquist, D.D., 6:25940
Shei, J.C., *See* Venier, C.G., 6:24909
Shen, G., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Shen, M., Fuel gas desulfurization, 6:25069
Shenoy, G.K., *See* Cashion, J.D., 6:25896
See Chein, C.L., 6:25897
Shephard, W.D., *See* Cason, N.M., 6:26493
Shepherd, A.D., *See* Robertson, R.C., 6:25396
Shepherd, K.R., RDF fuels in a waste-to-energy system -- the Teledyne National experience, 6:25829 (ANL/CNSV-TM—60, pp 319-346)
Sheppard, J.F., *See* Hyman, L.G., 6:26068
Sherman, S.S., Charmed-meson production in 200-GeV/c pion-beryllium interactions, 6:26482 (DOE/ER/03072—120)
Sherwood, E.G., *See* Lipson, J., 6:26646
Shetron, S.G., *See* Dohrenwend, R.E., 6:26120
Shevchenko, V., *See* Ammar, R., 6:26504
Shih, J.Y., Energy conservation applications of microprocessors, 6:25783 (CONF-7910214—, pp vp, 57p)
Shih, S., *See* Newton, J.O., 6:26588
Shimamura, S., Study of flywheel energy storage system for electric utilities, 6:25577 (CONF-790203—, pp 12p, Paper 41)
Shimp, N.F., *See* Griffin, R.A., 6:24930
Shirtliffe, C.J., Blown cellulose fiber thermal insulations. Part 2. Thermal resistance, 6:25681
See Bomberg, M., 6:25680, 6:25752
Shoemaker, F., Information and the solar consumer, 6:25220 (SERI/TP—753-1205)
Shoemaker, F.C., *See* Clark, A.R., 6:26500
Shohet, J.L., *See* Bauer, F., 6:26666
Shrauner, J.E., *See* Hammer, C.L., 6:26478
Shupe, M., *See* Berg, D., 6:26509
See Koester, L.J., 6:26499
Shyn, T.W., Doubly differential cross sections of secondary electrons ejected from gases by electron impact: 25 —250 eV on H_2, 6:26465
Sichel, M., *See* Nicholls, J.A., 6:25071
Sidorov, V., *See* Ammar, R., 6:26504
Siegrist, J.L., *See* Schindler, R.H., 6:26486
Sievers, A.J., *See* Chraplyvy, A.R., 6:25929
See Pramanik, D., 6:25388
Silcox, J., *See* Holloway, P.H., 6:25247
Sills, D.L., *See* Moss, T.H., 6:25539
See Unseld, C.T., 6:25603
Silsbee, R.H., *See* Pramanik, D., 6:25388
Silver, H.F., *See* Hurtubise, R.J., 6:24915
See Miller, R.L., 6:24891
Silverman, B.G., Multimarket, multitechnology, multiattribute technological forecasting, 6:25611
Silvestro, E., Toxicity of chemical compounds used in enhanced oil recovery, 6:25040 (DOE/BETC/IC—80/3(Vol.1), pp 6p, Paper 20)
Simmons, G., Microcracks and energy. Progress report, April 1, 1980-February 28, 1981, 6:25089 (DOE/ER/04972—1)
Simmons, J.D., Light distribution in three earth-embanked houses, 6:25743
Simmons, J.E., *See* Bhatia, T.S., 6:26576
Simon, R.L., Techniques for assessing the wind energy resource in the Southwest region, 6:25418 (PNL—3672)
Simoneit, H.W., *See* Ebert, G., 6:25804
Simpkins, J.C., *See* Mears, D.R., 6:25355
See Roberts, W.J., 6:25729
Simpson, J.D., *See* Slater, D.C., 6:26662
Sims, C.S., Reference dosimetry for various Health Physics Research Reactor spectra, 6:26612 (ORNL/TM—7748)
Singh, B.R., Effects of acid precipitation on soil and forest. 3. Sulfate sorption by acid forest soils, 6:26187 (CONF-800365—, pp 194-195)
Singh, H., *See* Singh, I., 6:25326
Singh, I., Solar data base management system, 6:25326 (CONF-800804—40)
Singh, R., Review of conductor-insulator-semiconductor (CIS) solar cells, 6:25267
Singh, R.P., *See* Pedersen, L.D., 6:25814
Sinsheimer, F., *See* LaFontaine, G., 6:25293
Sirotenko, V., *See* Ammar, R., 6:26504
Sivers, D., Components of QCD, 6:26572
Spin effects in e^+e^- annihilations, 6:26518 (ANL-HEP-CP—80-69)
See Berger, E.L., 6:26533
Skarby, L., *See* Bengtson, C., 6:26342
Skartveit, A., Observed relationships between ionic composition of precipitation and runoff, 6:26261 (CONF-800365—, pp 242-243)
See Johannessen, M., 6:26254

Skeffington, R.A., *See* Rippon, J.E., 6:26275
Skillern, C.R., *See* Liebenthal, A.M., 6:25072
Skillings, B.J., *See* Zachary, L.W., 6:26045
Skinner, D.M., *See* LaMarca, M.E., 6:26318
Skogerboe, R.K., Environmental effects of western coal combustion. Part III. The water quality of Rosebud Creek, Montana. Final report, 6:24937 (PB—81-113615)
Skorton, D., *See* Wisenberg, G., 6:26309
Skowronski, R.P., *See* Heredy, L.A., 6:24876
SLAC-LBL Mark II Collaboration, Recent results on decays of D mesons from Mark II, 6:26507
Sladkovic, R., *See* Reiter, R., 6:26143
Slanina, J., Detection of acid compounds in the atmosphere by careful sampling and analysis of rainwater, 6:26134 (CONF-800365—, pp 138-139)
See Asman, W.A.H., 6:26135
Slater, D.C., Absorpton and hot-electron production for 1.05 and 0.53 μm light on spherical targets, 6:26662
Slattery, E.F., *See* Hill, A.J. Jr., 6:26317
Slattery, J.C., Interfacial effects in the recovery of residual oil by displacement: studies at Northwestern University, 6:25019 (DOE/BETC/IC—80/3(Vol.2), pp 14p, Paper 20)
Slattery, P., *See* Berg, D., 6:26509
Slaughter, A.J., *See* Fajardo, L.A., 6:26485
See Schiz, A., 6:26484
Sliter, G.E., *See* Woodfin, R.L., 6:25538
Slobodkin, L.B., *See* Maguire, B. Jr., 6:26214
Slutz, S.A., *See* Mendel, C.W., 6:26708
Smalley, R.E., Hypersonic beam laser photolysis. Technical progress report, July 15, 1980-March 15, 1981, 6:25997 (DOE/ER/06035—3)
Smart, W., *See* Ammar, R., 6:26504
Smirnitsky, V., *See* Ammar, R., 6:26504
Smith, B.F., *See* Venier, C.G., 6:24909
Smith, C.F., Models and criteria for LLW disposal performance, 6:25118 (CONF-801217—, pp 333-339)
See Cohen, J.J., 6:25117
Smith, D., *See* Gears, G.E., 6:25533
Smith, D.D., Animal Investigation Program: Nevada Test Site and Vicinity. Annual report, 1979, 6:26196 (DOE/DP/00539—042)
Selected radioisotopes in animal tissues in Nevada: ^{90}Sr and ^{137}Cs measurements from 1956 to 1977, 6:26195 (DOE/DP/00539—040)
Smith, D.G., *See* Paton, D.L., 6:25415
See Yamartino, R.J., 6:26109
Smith, D.L., Analysis of in-situ tritium recovery from solid fusion-reactor blankets, 6:26675 (CONF-801011—90)
First-wall/blanket materials selection for STARFIRE tokamak reactor, 6:26680 (CONF-801011—95)
See Baker, C.C., 6:26678
See Hunt, C.D., 6:26245
Smith, D.M., Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1, 6:25404 (SAND—80-7154/1)
Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description, 6:25405 (SAND—80-7154/2)
Smith, E., *See* Koester, L.J., 6:26499
Smith, E.M., *See* Walker, J.N., 6:25805
Smith, G.E., *See* Flanagan, C.A., 6:26700
Smith, G.M., *See* Heppner, J.P., 6:26440
Smith, G.W., *See* Shearer, J.A., 6:24956
Smith, J.F., Thermodynamics and phase equilibria in the binary systems of vanadium with IV B elements, 6:25907 (IS-M—319)
Smith, J.M., *See* Wang, S.Y., 6:25651
Smith, J.W., *See* Foster-Pegg, R.W., 6:25442
Smith, L.L., *See* Heppner, J.P., 6:26440
Smith, M.J., Engineered barrier development for a nuclear waste repository in basalt, 6:25137 (RHO-BWI-SA—64)
Smith, M.L., *See* Cunningham, J.A., 6:26058
Smith, M.W., *See* Tokuhata, G.K., 6:26319
Smith, N.K., *See* Good, W.D., 6:24899, 6:25058, 6:25990
Smith, P.D., Accuracy of finite-element models for the stress analysis of multiple-holed moderator blocks, 6:25485 (GA-A—16234)
Smith, R.D., Low-level radioactive waste modeling needs from the USNRC perspective, 6:25109 (CONF-801217—, pp 31-39)
Smith, R.F., *See* Hyman, L.G., 6:26068
Smith, R.P., Six tesla analyzing magnet for heavy-ion beam transport, 6:26067 (CONF-800980—39)
Smith, S.B., Alberta oil sands environmental research program. An overview, 6:26132 (CONF-800365—, pp 132-133)
Smith, S.V., *See* Henderson, R.S., 6:26246
Smith, T., *See* Strickland, J.H., 6:25425
Smith, T.P., Response of a benthic marine microcosm subjected to changes in energy flow, 6:26243
Smith, W.H., *See* Clark, A.R., 6:26500
Smither, R.K., *See* Henning, W., 6:26070
Smol, R., *See* Farber, G., 6:24865
Smoot, G.F., *See* Gorenstein, M.V., 6:26433
Smyk, E.B., Methods of improving limestone utilization in FBC, 6:24955 (CONF-800806—44)
Snellings, I.R., *See* Dowgiallo, E.J. Jr, 6:25877
Snider, M., *See* Habegger, L., 6:25229
Snow, M.G., *See* Long, P.E., 6:26429
Snow, R., *See* Bridges, J., 6:25083
Snyder, W.O., Commercial scale demonstration of the Maraflood process: M-1 project, Crawford County, Illinois, 1979-1980, 6:25010 (DOE/BETC/IC—80/3(Vol.2), pp 12p, Paper 10)
Soliman, M., Numerical modeling of thermal recovery processes SUPRI-TR-12, 6:25034 (DOE/ET/12056—12)
Sollie, B., *See* Mohn, E., 6:26258
Solomon, J.A., *See* Cada, G.F., 6:25462
Solomon, P.R., Relation between coal aromatic carbon concentration and proximate analysis fixed carbon, 6:24918
Somasundaran, P., Adsorption from flooding solutions in porous media: a study of interactions of surfactants and polymers with reservoir minerals, 6:25013 (DOE/BETC/IC—80/3(Vol.2), pp 12p, Paper 14)
Somerton, W.H., *See* Radke, C.J., 6:25022
Sommerlad, R.E., Considerations affecting dedicated boiler design for refuse-derived fuels (RDF), 6:26059 (ANL/CNSV-TM—60, pp 391-402)
Somorjai, G.A., *See* Ferrer, S., 6:26000
Sonnerup, B.U.O., *See* Sckopke, N., 6:26441
Sopori, B.L., Optical diffraction technique for determination of crystal orientations, 6:25926
Sorensen, J.C., *See* Chatterjee, N., 6:24862
Sowell, E.F., Series-parallel solar-augmented rock-bed heat pump. Final report, 6:25338 (DOE/CS/34697—T3)
Series-parallel solar-augmented rock-bed heat pump. Convolution model of rock bed, 6:25390 (DOE/CS/34697—T1)
Spaite, P.W., *See* Isa cs, G.A., 6:24952
Sparks, C.J. Jr., Research with x rays, 6:26093
Sparks, R.K., *See* Casavecchia, P., 6:26460
Spearman, J.E., *See* Warholic, G.R., 6:24906, 6:24935
Specht, J.R., *See* McKeown, R.D., 6:26575
Spejewski, E.H., *See* Bingham, C.R., 6:26592
Spencer, D.B., *See* Schroeder, R.L., 6:26057
Sperduto, A., *See* Enge, H.A., 6:26593
Spevak, L., *See* Kupperman, D.S., 6:25934
Spielberg, F., *See* Mick, C., 6:25327
Spigarelli, S.A., Assessment of the impacts of water intakes on alewife, rainbow smelt, and yellow perch populations in Lake Michigan, 6:26296 (ANL/ES—109)
Spillman, C.K., Solar energy utilization in a greenhouse/animal shelter combination, 6:25811
Spingarn, J.R., *See* Hoover, W.R., 6:25178
Spinka, H., *See* Auer, I.P., 6:26489, 6:26490
Squillante, M.R., Low cost, sprayed CdTe solar cell research. Semiannual progress report, August 15-February 14, 1981, 6:25257 (SERI/PR—8104-3-T3)
Squires, T.G., Chemical studies of the Ames oxydesulfurization process, 6:24911
See Venier, C.G., 6:24909
Sresty, G., *See* Bridges, J., 6:25083
Srinivasan, S., *See* Lynn, D.K., 6:25670
Srinivasan, T., *See* Egger, H., 6:26037
Srirath, S., *See* Ettinger, K.V., 6:26084, 6:26085
Srivastava, S.C., *See* Zoghbi, S.S., 6:26306
Srivastava, V.J., *See* Jerger, D.E., 6:25194
Staats, E.B., Department of Energy's reorganization of Energy contingency planning holds promise - but questions remain, 6:25633 (EMD—81-57)
Special care needed in selecting projects for the Alternative Fuels Program, 6:25636 (EMD—81-36)
Stadjuhar, S.A., *See* Brown, K.C., 6:25348
Staffin, K., Conversion of atactic polypropylene waste to fuel oil, 6:25773 (CONF-800272—, pp 170-175)
Stafford, B.L., High-temperature Moessbauer study of ^{57}Fe interstitials in Chevrel phases, 6:25945 (CONF-800954—4)

Stahl, G.D., *See* Klaus, E.E., 6:25021
Staiger, P.J., *See* Wang, S.Y., 6:25651
Stalker, A.C., *See* Mandler, J.W., 6:25536
Stamm, M.E., Airborne cathodic-protection surveys, 6:26029
Stamoudis, V.C., Biological removal of organic constituents in high-Btu coal gasification wastewaters, 6:24924 (CONF-8006171—1)
Stamper, K.R., Alternative fuels data bank, 6:25888 (DOE/BETC/IC—80/3(Vol.4), pp 5p, Paper 23)
Evaporative emissions from vehicles operating on methanol/gasoline blends, 6:25889 (DOE/BETC/IC—80/3(Vol.4), pp 18p, Paper 24)
Fleet trials using methanol/gasoline blends, 6:25890 (DOE/BETC/IC—80/3(Vol.4), pp 18p, Paper 25)
Stangeby, P.C., Rapid pyrolysis and hydropyrolysis of Canadian coals, 6:24884
Stanton, N.R., *See* Dankowych, J.A., 6:26492
Stapfer, G., Progress report No. 29 for a program of thermoelectric generator testing and RTG degradation mechanisms evaluation, 6:25657 (DOE/ET/33003—T2)
Starr, C., Three Mile Island nuclear accident: the other lesson, 6:25564
Stassis, C., Field induced magnetic form factor of Zr, 6:25933
Statt, T.G., Energy-efficiency directory of refrigerators and refrigerator-freezers, 6:25719 (DOE/CS/20315—T11)
Staub, H.L., Micellar-polymer joint demonstration project, Wilmington Field, California, 6:25006 (DOE/BETC/IC—80/3(Vol.2), pp 17p, Paper 6)
Residual oil saturation determination Wilmington micellar-polymer project, October, 1979-October, 1980, 6:24981 (DOE/BETC/IC—80/3(Vol.1), pp 15p, Paper 6)
Stauning, P., *See* Baker, D.N., 6:26443
Stavinoha, L.L., Accelerated stability test techniques for middle distillate fuels, 6:25060 (DOE/BETC/IC—80/3(Vol.4), pp 15p, Paper 13)
Optimization of accelerated stability-test techniques for diesel fuels. Final report, 6:25052 (DOE/BC/10043—25)
Stearns, C.A., Combustion-system processes leading to corrosive deposits, 6:26010 (DOE/NASA/2593—27)
Stearns, J.W., *See* Berkner, K.H., 6:26454
Stebbings, J.H. Jr., Epidemiology, public health, and health surveillance around point sources of pollution, 6:26314
Morbidity and mortality in Los Alamos County, New Mexico. I. Methodological issues and preliminary results, 6:26320
Steele, G.L., *See* Brinkman, D.W., 6:25043
See Sutterfield, F.D., 6:24900
Steele, H., *See* Wen, L., 6:25311
Steele, R.S., Composite flywheel balance experience, 6:25883 (Y/DX—290)
Steele, W.J., *See* Pruneda, C.O., 6:25942
Stefanski, R., *See* Barish, B., 6:26517
Stein, T.R., *See* DeCorso, S.M., 6:25440
Steinberg, M., Accelerator spallation reactors for breeding of fissile fuel and transmuting fission products, 6:26066 (BNL—29588)
Technologies for the recovery and disposal of carbon dioxide, 6:26112 (BNL—29526)
Steindler, M.J., Method for estimating the challenge to an air-cleaning system resulting from an accidental explosive event, 6:25166 (CONF-801038—23)
Steiner, D., *See* Flanagan, C.A., 6:26700
Steinnes, E., *See* Allen, R.O., 6:26119
See Hanssen, J.E., 6:26124
Stekas, J., *See* Abshire, G., 6:26498
Stelson, P.H., *See* Gilai, D., 6:25507
Stenberg, V.I., *See* Baltisberger, R.J., 6:24853, 6:24914
Stenson, A.E., *See* Henrikson, L., 6:26371
Stephens, F.S., *See* Newton, J.O., 6:26588
Stephenson, E.J., *See* Henning, W., 6:26070
See McKeown, R.D., 6:26575
Stephenson, G.J. Jr., *See* Goldman, T., 6:26526
Stepnewski, D.D., *See* Mahaffey, M.K., 6:25509
Stern, S.A., Permeation cascades for the separation of krypton and xenon from nuclear reactor atmospheres, 6:25567
Separation of krypton and xenon by selective permeation, 6:25516
Sternberg, D., *See* Allen, A., 6:25288
Sternberg, S., *See* Ne'eman, Y., 6:26562, 6:26571
Steunenberg, R.K., *See* Barney, D.L., 6:25585
Stevens, H.C., *See* Baker, C.C., 6:26678
Stevens, P., *See* Goldburg, A., 6:25009
Stevenson, J.C., *See* Kemp, W.M., 6:26247
Stevenson, P.M., *See* Barger, V., 6:26539
Stewart, A.J., Littoral-pelagial interactions: the role of dissolved humic materials, 6:26209 (DOE/EV/01599—T1(Pt.4))
Stewart, C.A., *See* Racine, W.C., 6:25408
Stewart, D.H., *See* Ballantyne, W.E., 6:25205
Stewart, D.R., Energy performance of an earth sheltered active solar house, 6:25364
Stewart, J.H. Jr., Determination of ultratrace concentrations of uranium and thorium in natural waters by x-ray fluorescence, 6:25964 (CONF-810647—6)
Stewart, K.K., Consumer evaluation of an earth sheltered solar residence, 6:25367
Stewart, L.E., *See* Frey, B.C., 6:25813
Steyert, W.A., *See* Barclay, J.A., 6:25949
Sticksel, F.M., Quality-assurance approach for the Elmo Bumpy Torus Proof-of-Principal experiment, 6:26688 (CONF-810654—2)
Stinson, C.A., *See* Schroeder, R.L., 6:26057
Stoddard, J.A., Systems model for evaluating population dose from low-level waste activities, 6:25168 (CONF-801217—, pp 327-331)
Stoebet, M.B., *See* Alfheim, I., 6:26118
Stoker, G.C., Isolated data-acquisition system, 6:26723 (SAND—80-1952)
Stokke, K., *See* Fjeld, S., 6:25253
Stoltz, R.E., *See* Hoover, W.R., 6:25178
Stone, R.E., *See* Bingham, C.R., 6:26592
Stoner, R., *See* Brode, R., 6:25412
Storms, E.K., Phase relationship, vaporization, and thermodynamic properties of neodymium hexaboride, 6:25986
Stottlemyer, J.R., *See* Dohrenwend, R.E., 6:26120
Strait, J., *See* Schindler, R.H., 6:26486
Strand, L., Effect of acid precipitation on tree growth, 6:26338 (CONF-800365—, pp 64-67)
Strand, R.C., *See* Miller, M., 6:26483
Stratton, L.E., *See* Little, C.A., 6:25105
Streets, D.G., Impact of New Source Performance Standards on advanced industrial energy technology, 6:25604 (CONF-801210—25)
Status of pollution-control technologies for industrial boilers, 6:26063 (CONF-800608—7)
Strickland, J.H., Vortex model of the Darrieus turbine: an analytical and experimental study. Final report, 6:25425 (SAND—81-7017)
Striepens, A.H., Heat transfer in refractory fiber insulations, 6:25760
Strom, S.S., *See* Chapman, J.N., 6:25656
Strong, R.E., Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Strovink, M., *See* Clark, A.R., 6:26500
Struble, G.L., *See* Wilhelmy, J.B., 6:26589
Stuanes, A.O., Effects of acid precipitation on soil and forest. 5. Release and loss of nutrients from a Norwegian forest soil due to artificial rain of varying acidity, 6:26188 (CONF-800365—, pp 198-199)
See Abrahamsen, G., 6:26139
Stump, R., *See* Ammar, R., 6:26504
Stupak, A.P., *See* Bushuk, B.A., 6:25995
Stutts, J.D., Development of instrumental methods of analysis of sulfur compounds in coal-process streams: computer program manual for estimating concentrations of inorganic sulfur moieties from a thermodynamic data base. Quarterly technical progress report, January-March 1981, 6:24903 (DOE/ET/10482—T1)
Styron, C.E., Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Sucov, E.W., Inertial-confinement fusion central-station electric-power-generating plant. Final report, March 1, 1979-September 30, 1980, 6:26690 (DOE/DP/40086—1(Vol.1))
Inertial-confinement fusion central-station electric-power-generating plant. Final report, March 1, 1979-September 30, 1980, 6:26691 (DOE/DP/40086—1(Vol.2))
Suffet, I.H., *See* Cernansky, N.P., 6:25874
Sullivan, D., *See* Slater, D.C., 6:26662
Sullivan, M., Steel reinforced concrete shell structures: forming techniques, structural design, and earth sheltered applications, 6:25705 (CONF-800438—, pp 161-171)
Sullivan, R.F., Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report for the period October-December 1980 and annual summary for 1980, 6:24863 (FE—2315-60)
Sullivan, R.M., *See* Smith, P.D., 6:25485
Sullivan, S.M., Preliminary evaluation of impingement and entrainment by

ocean thermal energy conversion (OTEC) plants, 6:25319 (LBL—11833)
Sullivan, W.N., *See* Lobitz, D.W., 6:25434
Suloway, J.J., *See* Griffin, R.A., 6:24930
Summers, D.A., *See* Green, B.H., 6:25740
Summers, K., Methodology to evaluate the potential for ground water contamination from geothermal fluid releases. Final report, 6:25395 (PB—81-111114)
Summers, R., Solar housing in London, 6:25369
Sun, K., *See* Strickland, J.H., 6:25425
Sunier, J.W., *See* Cizewski, J.A., 6:26594
See Flynn, E.R., 6:26590
Supalla, R.J., *See* Lansford, R.R., 6:25430
Suranyi, P., *See* Scanio, J.J.G., 6:26569
Surkalo, H., Experimental evaluation of reservoir pretreatment in chemical flooding, 6:25015 (DOE/BETC/IC—80/3(Vol.2), pp 12p, Paper 16)
Surko, P., *See* Clark, A.R., 6:26500
Suter, G.W. II, Preliminary environmenal assessment of the University of Minnesota, Duluth Coal Gasifier, FY 1980, 6:26149 (ORNL/TM—7728)
Sutter, R., *See* Zarbakhsh, F., 6:26488
Sutterfield, F.D., Processing and stability characteristics of liquids from coal, shale, and heavy oils, 6:24900 (DOE/BETC/IC—80/3(Vol.4), pp 6p, Paper 8)
Suurmond, G., *See* Van Dam, H., 6:26364
Svalastog, D., *See* Rosseland, B.O., 6:26381
Svedberg, R.C., W-Re composite tube fabricated by chemical vapor deposition for application in an 1800°C high thermal efficiency fuel-processing furnace, 6:25908
Svensson, B.S., *See* Friberg, F., 6:26367
Swallom, D., *See* Brogan, T.R., 6:25653
Swallow, E.C., *See* Lockyer, N., 6:26502
Swanson, G.D., Development of fracture toughness measurement capability by ultrasound. Final report, 6:26044 (BDX—613-2625)
Swanson, J.R., Shape resonance effects in the photoabsorption spectra of BF_3, 6:26458
Swanson, R.A., *See* Yager, P.M., 6:26487
Sweeney, J.E., *See* Craighead, H.G., 6:25265
Sweeney, R.E., *See* Brand, S.W., 6:25055
Sweig, R.A., Permissible-limit and flaw-size determination in an experimental fusion-reactor component, 6:26693 (GA-A—14847)
Swift, W.M., *See* Smyk, E.B., 6:24955
Swindeman, R.W., Progress in understanding the mechanical behavior of pressure-vessel materials at elevated temperatures, 6:25899 (CONF-810625—18)
Swindle, D.W. Jr., Hexapartite safeguards project team 3: material accounting and control questionnaire, 6:25172 (K/OA—5001)
Szalata, Z.M., *See* Rock, S., 6:26511
Szalay, R.A., Reaction of the nuclear industry to the Three Mile Island accident, 6:25559
Szydlowski, R.F., Analysis of transient heat loss in earth sheltered structures, 6:25738

T

Taback, H.J., *See* Parker, N.R., 6:26152
Tabasaran, O., Main research topics in the Department of Waste Management of the University of Stuttgart and a report on current investigations of practical interest concerning landfill gas, 6:25180 (CONF-7909198—, pp 535-557)
Taflove, A., *See* Bridges, J., 6:25083
Takayama, K., Final beam emittances at the end of anti P-accumulation for the Fermilab anti P source, 6:26075 (DOE/CH/03000—T3)
Takyi, S., *See* Nyborg, M., 6:26141
Talaga, R., *See* Zarbakhsh, F., 6:26488
Talaga, R.L., *See* Lockyer, N., 6:26502
Talbot, M., *See* Squillante, M.R., 6:25257
Talib, A., *See* Fritz, J.J., 6:25292
Talmage, S.S., Literature review: response of fish to thermal discharges. Final report, 6:26323 (EPRI-EA—1840)
See Yost, F.E., 6:26324
Tamm, C.O., Effects of artificial acidification with sulfuric acid on tree growth in Scots pine forest, 6:26349 (CONF-800365—, pp 188-189)
See Farrell, E.P., 6:26186
Tamplin, A., Representing public interest groups, 6:25550
Tamura, N., *See* Auer, I.P., 6:26489, 6:26490
Tanchoco, J.M.A., *See* Wysk, R.A., 6:25431
Tang, J.I.S., Use of macroreticular resin for separation of coal conversion process wastewater, 6:24931
Tang, J.S., *See* Santoro, R.T., 6:26629
Tang, P., *See* Tzung, F., 6:25946
Tang, W.M., Kinetic effects on ballooning modes in mirror machines, 6:26655
Tanihata, I., *See* Zarbakhsh, F., 6:26488
Tanner, K.I., Conversion of solvent-refined coal to liquid products in the presence of Lewis acids, 6:24887
Tans, P.P., *See* Muller, R.A., 6:26071
Tao, C., *See* Koester, L.J., 6:26499
Tarman, P.B., *See* Jerger, D.E., 6:25194
Tarrer, A.R., Evaluation of a short-residence-time two-stage SRC process. Final report, 6:24861 (EPRI-AP—1827)
Tarvin, J.A., *See* Slater, D.C., 6:26662
TASSO-Collaboration, TASSO results on jets and QCD, 6:26513
Taub, F.B., Responses of aquatic microcosms to acute mortality, 6:26234
Synthesizing aquatic microcosms, 6:26215
Taureg, H., *See* Schindler, R.H., 6:26486
Taylor, L.T., *See* Dorn, H.C., 6:25968
See Hausler, D.W., 6:24917
Taylor, P.D., Electrodril system field test program: Phase II, Task C deep drilling system demonstration, 6:26019 (DOE/BETC/IC—80/3(Vol.1), pp 3p, Paper 22)
Taylor, S.R., *See* Huettenhain, H., 6:24954
Taylor, W.F., *See* Frankenfeld, J.W., 6:24901
Tchernev, H., *See* Ammar, R., 6:26504
Teigen, O., *See* Bjor, K., 6:26353
Temple, P.J., *See* Linzon, S.N., 6:26184
Teresi, J.D., Measures of radiological consequences in nuclear-reactor-safety assessments, 6:25524 (DOE/SF/71032—T10)
Tesar, D., Nuclear reactor maintenance technology assessment. Final summary report, September 16, 1978-September 15, 1979, 6:25499 (DOE/OR/06102—T1)
Tesauro, G.J., *See* Mansfield, D.K., 6:26040
Thakur, M.L., *See* Zoghbi, S.S., 6:26306
Tham, M.K., Surfactant optimization for DOE's field test: some unexpected phenomena, 6:25002 (DOE/BETC/IC—80/3(Vol.2), pp 9p, Paper 2)
See Lorenz, P.B., 6:25001
Theodosiou, G., *See* Auer, I.P., 6:26489, 6:26490
Theriot, D., *See* Barish, B., 6:26517
Thieberger, P., *See* Kreiner, A.J., 6:26585
Thiery, D., Analysis of pumping tests performed in a horizontal rectangular fracture, 6:26413 (LBL—12076, pp 103-109)
Thirst, T.J., Heat transfer versus pitch angle for nonventilated, triangular-sectioned, apex-upward air-filled space, 6:25751
Thomas, C.E., *See* Slater, D.C., 6:26662
Thomas, G.E., Carbon stripper foils for heavy-ion accelerators, 6:26069 (CONF-801111—46)
Thomas, G.H., Case for exotic baryon-baryon states, 6:26519 (ANL-HEP-CP—80-75)
Thomas, K.E., *See* Wilhelmy, J.B., 6:26589
Thomas, M.G., Effects of catalysts on short contact time coal liquefaction, 6:24882
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883
See Sample, D.G., 6:24873
Thomlinson, W., *See* Wipf, H., 6:26608
Thommes, M.M., *See* Spigarelli, S.A., 6:26296
Thompson, D.H., *See* Chung, K.S., 6:25518, 6:25519
Thompson, G., Some considerations for tracer tests in low permeability formations, 6:26408 (LBL—12076, pp 67-73)
Thompson, L.J., *See* Averback, R.S., 6:25931
Thompson, M.E., Evidence of acidification of rivers of Eastern Canada, 6:26262 (CONF-800365—, pp 244-245)
Thompson, P.A., *See* Berg, D., 6:26509
Thompson, W.M., *See* Petty, J.A., 6:25511
Thorndike, E.H., First results on bare b physics, 6:26516
Thornton, J.D., *See* Eisenreich, S.J., 6:26182
Thornton, R., *See* Koester, L.J., 6:26499
Thorsen, G.W., High bank instead of high rise, 6:25702 (CONF-800438—, pp 12-132)
Thresh, H.R., *See* Killpatrick, D.H., 6:25655
Thring, J., *See* Maw, R., 6:25371
Thullen, P., *See* Weldon, D., 6:26695
Thurston, R.V., *See* Skogerboe, R.K., 6:24937
Tibbitts, G.A., Studies for the improvement of diamond drill bit hydraulics, 6:24995 (DOE/BETC/IC—80/3(Vol.1), pp 12p, Paper 24)

Tieleman, H.W., Planetary boundary-layer wind model evaluation at a mid-Atlantic coastal site, 6:25420 (DOE/ET/23007—80/1)
Tillequin, Forced-circulation steam generators designed and developed for energy recovery in industry, 6:25777 (CONF-800272—, pp 205-215)
Tiller, A.J., *See* Ang, P.G.P., 6:25261
Timberlid, J.A., Have changes in use of land influenced the regional lake acidification, 6:26283 (CONF-800365—, pp 352-353)
See Drabloes, D., 6:26201
Tippens, W.B., *See* Bhatia, T.S., 6:26576
Tipton, R., *See* Huang, K., 6:26568
Tisone, G.C., Effect of rare-gas diluents on the performance of an XeCl laser pumped by a high-intensity electron beam, 6:26034
Tobin, R.L., Issues associated with coal-slurry-pipeline development, 6:24945 (ANL/EES-TM—139)
Todd, A.M.M., Ideal MHD beta-limits of poloidally asymmetric equilibria, 6:26639 (PPPL—1787)
Tokuhata, G.K., History of health studies around nuclear facilities: a methodological consideration, 6:26319
Tolbert, L.M., Electron photoejection in carbanions. Progress report, July 1, 1980-June 30, 1981, 6:25998 (DOE/ER/10424—1)
Tollan, A., *See* Drabloes, D., 6:26332
Tollan, O., *See* Christophersen, N., 6:26205
See Dahl, J.B., 6:26183
Tomczuk, Z., Phase relationships in positive electrodes of high-temperature lithium aluminum/iron sulfide cells, 6:25587 (CONF-8010159—11)
Tomlinson, G.H., Role of clouds in atmospheric transport of mercury and other pollutants: 1. The link between acid precipitation, poorly buffered waters, mercury and fish. 2. The role of cloud water in atmospheric transport, 6:26133 (CONF-800365—, pp 134-137)
Tompkins, A.N., Marine biomass program. Annual report 1 Jan-31 Dec 79, 6:25255 (PB—81-113185)
Tompkins, H.G., *See* Butler, B.L., 6:25245
Tonnessen, K., Potential for acid precipitation damage to aquatic ecosystems of the Sierra Nevada, California (USA), 6:26281 (CONF-800365—, pp 338-339)
Tonutti, M., *See* Schindler, R.H., 6:26486
Torma, A.E., *See* Homhual, C., 6:25384
See Inal, O.T., 6:25385
Toshioka, K., *See* Auer, I.P., 6:26489, 6:26490
Toy, A.J., Environmental monitoring at the Lawrence Livermore National Laboratory: 1980 annual report, 6:26200 (UCRL—50027-80)
Traaen, T.S., Effects of acidity on decomposition of organic matter in aquatic environments, 6:26282 (CONF-800365—, pp 340-341)
Trachsel, C., *See* Abdou, M.A., 6:26667
Trachsel, C.A., *See* Baker, C.C., 6:26679
See Ehst, D.A., 6:26628
Tran, D.Q., Rapid-rate bituminous coal gasification. Annual report 1 Jan-31 Dec 79, 6:24872 (PB—81-114290)
Trantham, J.C., *See* Kleinschmidt, R.F., 6:25012
Trauth, C.A. Jr., Guidance for implementing an Environmental, Safety and Health Assurance Program. Volume 9. Model guidelines for environmental safety and health analysis activities, 6:26403 (SAND—81-0640)
Program standard for assuring that today's management obligations in environmental, safety, and health areas are met, 6:25607 (SAND—81-1359C)
Treanor, D., *See* deNoyelles, F. Jr., 6:26233
Trester, P.W., *See* Sweig, R.A., 6:26693
Trezek, G., *See* Reed, T.B., 6:25206
Trezek, G.J., Overview of prepared fuels technology, 6:25201 (ANL/CNSV-TM—60, pp 55-79)
Tribus, M., Thermoeconomics of energy systems. Progress report, June 1, 1980-May 30, 1981, 6:25799 (DOE/ER/10518—2)
Trilling, G.H., *See* Schindler, R.H., 6:26486
Trivich, D., *See* Papadimitriou, L., 6:25272
Troeng, E., *See* Bengtson, C., 6:26342
Troller, Oxygen-converter gas recovery, 6:25770 (CONF-800272—, pp 108-118)
Troutman, D., Comparison of lead, manganese, and zinc transport in three Adirondack lake watersheds, New York, 6:26269 (CONF-800365—, pp 262-263)
Troutman, D.E., *See* Galloway, J.N., 6:26267
See Johannes, A.H., 6:26190
Trucano, T.G., *See* Hicks, D.L., 6:26062
Truhan, J.J., *See* Bockris, J.O'M, 6:25243
Trumbo, B.E., Theory for coloring bivariate statistical maps, 6:26733 (DOE/EV/10428—9)
Trunk, A.D., Three Mile Island: a resident's perspective, 6:25554
Trunk, E.V., *See* Trunk, A.D., 6:25554
Tsai, C.L., Electrical and thermal transport coefficients of pure vanadium, 6:25922
Tsai, C.M., *See* Chou, K.D., 6:26322
Tsai, H.T., *See* Pung, T.C., 6:25974
Tsang, C.F., *See* Bodvarsson, G.S., 6:25401
Tsang, W.T., *See* Miller, R.C., 6:25955
Tsukamoto, O., Identification of quench origins in a superconductor with acoustic emission and voltage measurements, 6:26027
Tsutsui, Y., *See* Shimamura, S., 6:25577
Tu, K.M., Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980, 6:25720 (NBSIR—80-2145(DOE))
Tuccillo, J., The impact of residential energy conservation standards on credit markets, 6:25723 (PB—81-106940)
Tucker, R.H., *See* Yano, H., 6:26725
Turcotte, R., *See* Squillante, M.R., 6:25257
Turner, A.P.I., Deformation microstructures and mechanical equations of state, 6:25898 (CONF-801148—6)
Turner, C.B., *See* Shearer, J.A., 6:24956
Turner, L.R., Electromagnetic effects involving a tokamak reactor first wall and blanket, 6:26676 (CONF-801011—91)
Safety of superconducting magnets for fusion: thermal and electromagnetic effects of rapid TF coil discharge, 6:26686 (CONF-801011—103)
See Baker, C.C., 6:26678
See Evans, K. Jr., 6:26671
Turner, W.D., *See* Mujahid, A., 6:25228
Tuszewski, M., *See* Lipson, J., 6:26646
Tveite, B., Effects of acid precipitation on soil and forest. 8. Foliar nutrient concentrations in field experiments, 6:26355 (CONF-800365—, pp 204-205)
Effects of acid precipitation on soil and forest. 9. Tree growth in field experiments, 6:26356 (CONF-800365—, pp 206-207)
Tye, R.P., Performance characteristics of foamed-in-place urea formaldehyde insulation, 6:25721 (ORNL-SUB—78/86993/1)
Thermal transmission measurements of insulation, 6:25677
Tye, S.H., *See* Buchmueller, W., 6:26523
Tyndall, R.L., Effects of thermal additions on the presence of pathogenic and nonpathogenic free-living amoebae at the Savannah River Laboratory, 6:26294 (DP-MS—81-64)
Tzung, F., Effect of couple-stress on the pure bending of a prismatic bar, 6:25946 (GA-A—16001)

U

Ula, A.H.M.S., *See* Conley, P.L., 6:25481
Ulbricht, J., *See* Bieszk, J.A., 6:26584
Ulerich, N.H., Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
See Keairns, D.L., 6:24939
Underwood, D., *See* Auer, I.P., 6:26489, 6:26490
Unseld, C.T., Sociopolitical effects of energy use and policy. Supporting paper 5, 6:25603 (PB—81-114894)
Upton, A.C., Health impact of the Three Mile Island accident, 6:25506
Urban, P., Geothermal hydrogen sulfide removal, 6:25394 (DOE/ET/27203—1)
Uri, N.D., Estimating undiscovered oil resources: an engineering approach, 6:24973
Urtiew, P.A., Flame propagation in gaseous fuel mixtures in semiconfined geometries, 6:25079 (UCID—19000)
Uziel, M.S., *See* Yost, F.E., 6:26399

V

Vadnais, K., Earth shelter design revival: who's building what, where, 6:25707 (CONF-800438—, pp 177-184)
Vahlstrom, T.C., Field method for determining pulsation in orifice meters, 6:25077
VaKuiken, J., Energy, capacity, and economic effects of cogeneration

interfaced with electric-utility systems, 6:25438 (CONF-801210—27)
Valayapetre, M., *See* Inal, O.T., 6:25385
Valen, S., *See* Ammar, R., 6:26504
Vallance, J.K., *See* Fucinari, C.A., 6:25862
Van Dam, H., Impact of acid precipitation on diatoms and chemistry of Dutch moorland pools, 6:26364 (CONF-800365—, pp 298-299)
Van der Plicht, J., *See* Wilhelmy, J.B., 6:26589
Van Horn, L.E., Improved oil recovery by micellar-polymer flooding El Dorado, Kansas, field, 6:25004 (DOE/BETC/IC—80/3(Vol.2), pp 8p, Paper 4)
Van Orden, J.W., Mesonic processes in deep-inelastic electron scattering from nuclei, 6:26607
Van Voris, P., *See* Ausmus, B.S., 6:26178
Vander Wall, E.M., *See* Rudnicki, M.I., 6:25078
Vanderborght, O.L.J., *See* Vangenechten, J.H.D., 6:26263
Vanderpol, A.H., Application of computer graphics to air quality data analysis. Technical report, 6:26155 (PB—81-113623)
Vangenechten, J.H.D., Acidification of Belgian moorland pools by acid sulfur-rich rainwater, 6:26263 (CONF-800365—, pp 246-247)
Vangenechten, J.H.D., Vanderborght, O.L.J., Effect of acid pH on sodium and chloride balance in an inhabitant of acid freshwaters: the waterbug Corixa punctata (Illig.) (Insecta, Hemiptera), 6:26382 (CONF-800365—, pp 342-343)
Varanini, E.E. III, Reassessing the nuclear option: Three Mile Island from a state perspective, 6:25560
Vardiman, J.W., *See* Gaeke, M.E., 6:26305
Vargo, G.A., *See* Elmgren, R., 6:26396
Vargo, S.L., *See* Elmgren, R., 6:26396
Vary, J.P., Applications of moment methods to finite nuclei, 6:26603 (IS-M—320)
Vasudevan, C., *See* Clesceri, N.L., 6:26189
Vaucher, B.G., Negative hydrogen ion production in a cw plasma source, 6:26470
See Feinberg, B., 6:26658
Vaughan, B.E., Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2 supplement, ecological sciences, 6:26391 (PNL—3700Pt.2Suppl.)
Vaughan, D.H., *See* Baldwin, J.D.C., 6:25432
Vaughan, W.A., Facts about industrial energy conservation in the United States, 6:25676 (CONF-7910214—, pp vp, 30p)
Vaux, W.G., *See* Keairns, D.L., 6:24939
Vekshtein, G.E., Critical analysis of the electron gyrorelaxation heating device in the AMBAL facility, 6:26663 (UCRL-Trans—11689)
Vella, E.N., *See* Schindler, R.H., 6:26486
Vella, M.C., *See* Feinberg, B., 6:26658
Velthuys, B., *See* Radmer, R., 6:26308
Venier, C.G., Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909
See Squires, T.G., 6:24911
Venkataramanan, V., *See* Mathur, V.K., 6:24841
Venturini, E.L., Paramagnetic defects in shock-loaded TiO_2, 6:25937 (SAND—80-0019C)
See Dodson, B.W., 6:25953
See Golden, J., 6:25984
Verardo, A.E., Testing batteries for photovoltaic power systems, 6:25589 (SAND—81-0226C)
Verderber, R.R., Energy savings with solid-state ballasted high-pressure sodium lamps, 6:25841 (LBL—12595)
Verneau, A., *See* Dahan, G., 6:25768
Vervacke, *See* Troller, 6:25770
Vesilind, P.A., Air classification, 6:26056 (ANL/CNSV-TM—60, pp 117-129)
Viccaro, P.J., *See* Cashion, J.D., 6:25896
See Chein, C.L., 6:25897
Vidal, C.R., *See* Egger, H., 6:26037
Vidal, R.A., *See* Schindler, R.H., 6:26486
Videau, I., *See* Schindler, R.H., 6:26486
Vidt, E.J., *See* Keairns, D.L., 6:24939
Viecelli, J.A., Two-dimensional modeling of the oceans and CO_2 uptake, 6:26289 (UCRL—85673)
Vilardo, J.M., *See* Pickering, K.E., 6:25413
See Zabransky, J., 6:25416
Villard, B., *See* Blevins, R.D., 6:26020
Viola, V.E. Jr., *See* Awes, T.C., 6:26599
Violette, E.J., *See* Meltz, G., 6:26437
Vislie, T., *See* Fugelli, K., 6:26383
Vissers, D.R., *See* Tomczuk, Z., 6:25587
Vithayathil, J.J., *See* Sato, N., 6:25480
Vitols, V., *See* Dollard, G.J., 6:26121
Vo-Dinh, T., Lightpipe luminoscope for monitoring occupational skin contamination, 6:26094
See Gammage, R.B., 6:26095
Voegele, M., In situ premeability measurements for an underground compressed air storage project, 6:26407 (LBL—12076, pp 45-50)
Voelker, J., Preliminary evaluation of automated ICES selection methodology, cost, 6:25639 (CONF-800804—41)
Voelz, G.L., *See* Stebbings, J.H. Jr., 6:26320
Vogel, H.F., Internal resistive initiation coil electromagnetics in the FED/INTOR baseline design, 6:26633 (LA—8784-MS)
Vogel, P., Reactor antineutrino spectra and their application to antineutrino-induced reactions II, 6:25501 (HEDL-SA—2303-FP)
Vogt, O., *See* Burlet, P., 6:25963
Voigt, G.K., Acid precipitation and soil buffering capacity, 6:26336 (CONF-800365—, pp 53-57)
Volchok, H.L., *See* Bowen, V.T., 6:26169
Volk, L.J., Relation between the cation exchange capacity, clay content and surface area in western reservoir rock, 6:24997 (DOE/BETC/IC—80/3(Vol.1), pp 9p, Paper 26)
See Gall, B.L., 6:24998
Vollmer, R., Representing the Nuclear Regulatory Commission, 6:25547
Von Schonfeldt, H., *See* Durai-Swamy, K., 6:24859
Vosko, S.H., *See* MacDonald, A.H., 6:25921
Voss, M.D., Environmental monitoring at Ames Laboratory: calendar year 1980, 6:26167 (IS—4768)
Voyvodic, L., *See* Ammar, R., 6:26504
Vyas, K.C., Synthetic fuels from eastern oil shale. Final report, 6:25084 (DOE/R4/10185—T1)

W

Wada, R.Y., Application of photochemical models. Volume III. Recent sensitivity tests and other applications of the LIRAQ model. Final report, 6:26154 (PB—81-112898)
Wade, W.H., *See* Scamehorn, J.F., 6:25030
See Schechter, R.S., 6:24974
Wadlinger, E.A., *See* Minehart, R.C., 6:26491
Wadt, W.R., *See* Cohen, J.S., 6:26464
Wagner, R., *See* Auer, I.P., 6:26489, 6:26490
Wahle, H.W., New high-temperature guarded hot-box facility for reflective insulation, 6:25761
Wahlig, M., *See* Schiller, S.R., 6:25360
Waide, J.B., Microcosm approach to the study of biogeochemical systems. 2. Responses of aquatic laboratory microcosms to physical, chemical and biological perturbations, 6:26220
See Schindler, J.E., 6:26219
Waite, K.G., *See* Lewis, L.F., 6:25321
Waldron, M.C., *See* Schindler, J.E., 6:26219
See Waide, J.B., 6:26220
Walia, D.S., *See* Fuller, E.L. Jr., 6:24964
Walker, F.E., Comparison of molecular-dynamics calculations with observed initiation phenomena, 6:26099 (UCRL—85187)
See Karo, A.M., 6:26615
Walker, J.N., Production of beef with minimum grain and fossil energy inputs. Volume III. Input forms for the model. Final report, 6:25805 (PB—81-113706)
Walker, P.L. Jr., *See* Scaroni, A.W., 6:24886
Walker, R.D. Jr., *See* Shah, D.O., 6:25023
Walker, R.L., *See* Gilai, D., 6:25507
Walker, S.N., *See* Wilson, R.E., 6:25426
Wallin, D., Proceedings of the international conference on prepared fuels and resource recovery technology, 6:25199 (ANL/CNSV-TM—60)
Wallingford, P., *See* Tobin, R.L., 6:24945
Walsh, T., *See* Berg, D., 6:26509
Walter, D.K., Overview of the Department of Energy program for the recovery of energy and materials from urban solid waste, 6:25845
Refuse conversion to methane (RefCOM): a proof-of-concept anaerobic digestion facility, 6:25187
Walter, J.R., *See* Kaufman, K.R., 6:25894
Walter, R., *See* Gagne, G., 6:25866
Walters, L.C., *See* Porter, D.L., 6:25488
Walton, J.T., Status and problems of semiconductor detectors, 6:26079 (LBL—12380)
Wampler, M.S., Expression of earth sheltered architecture, 6:25700 (CONF-800438—, pp 94-100)
Wampler, W.R., *See* Follstaedt, D.M., 6:25928
Wang, C.C., *See* Huang, C., 6:26468

Wang, L.C., Comments on the linear system for the self-dual Yang-Mills fields, 6:26566 (BNL—29548)
Wang, P.Y., *See* Hwang, I.T., 6:25379
Wang, S.C., *See* Stern, S.A., 6:25567
Wang, S.T., Design and construction of a large superconducting MHD magnet for the Coal-Fired Flow Facility at the University of Tennessee Space Institute, 6:25647 (CONF-800631—10)
See Evans, K. Jr., 6:26671
Wang, S.Y., MHD channel study for the ETF conceptual design, 6:25651 (DOE/NASA/10769—14)
Warburton, E.K., *See* Alburger, D.E., 6:26580
Ward, C.E., Industrial survey of core handling, storage and analysis procedures for ROS measurements, 6:24985 (DOE/BETC/IC—80/3(Vol.1), pp 2p, Paper 11)
Ward, J.C., *See* Cady, K.B., 6:25526
Ward, R.L., Response of bacteria in wastewater sludge to moisture loss by evaporation and effect of moisture content on bacterial inactivation by ionizing radiation, 6:26321
See Yeager, J.G., 6:26313
Wares, R.N., Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4), pp 9p, Paper 26)
Warheit, G.J., *See* Chisholm, R.F., 6:25551
See Dohrenwend, B.P., 6:25553
Warholic, G.R., A statistical study of coal sulfur variability and related factors. Final report, 6:24906 (PB—81-111585)
A statistical study of coal sulfur variability and related factors - documentation for the coal sulfur variability data base and analytical program. Final report, 6:24935 (PB—81-111593)
Warkentin, P.A., Stationary convection in dilute solutions of ^{3}He in superfluid ^{4}He, 6:26479
Warner, P.C., Designing for the future: engineering plant, 6:25784 (CONF-7910214—, pp vp, 11p)
Warren, M.L., *See* Schiller, S.R., 6:25360
Wasan, D.T., Mechanism of oil bank formation, coalescence in porous media and emulsion stability: II, 6:25017 (DOE/BETC/IC—80/3(Vol.2), pp 13p, Paper 18)
Washburn, L.C., *See* Jay, M., 6:26008
Wasson, J.A., *See* Watts, R.J., 6:25036
Watson, A.P., Energy analysis of the coal fuel cycle: community health and resource change in an Appalachian coal county, 6:24971 (CONF-810652—5)
Watson, J., *See* Martin, R.L., 6:26668
Watson, J.M., *See* Cason, N.M., 6:26493
Watters, G.Z., *See* Bliesner, R.D., 6:25808
Watts, R.J., Single CO_2 injection well minitest in a low-permeability eastern carbonate reservoir--a preliminary report, 6:25036
Way, M., *See* Jensen, D.A., 6:26505
Weatherford, W.D. Jr, *See* Wright, B.R., 6:25051
Weaver, H.J., *See* Murray, R.C., 6:25171
Weaver, V.E., Evaluation of potential impacts to the utility sector for compliance with RCRA, 6:25840 (EPA/600/9—81-019B, pp 603-623)
Webb, A.H., Effect of chemical weathering on surface waters, 6:26276 (CONF-800365—, pp 278-279)
Weber, M.J., Implications for habitability design and energy savings in earth sheltered housing, 6:25744
Webster, T.F., *See* Levis, A.H., 6:25815
Webster, W.H. Jr., Progress and forecast in electric-vehicle batteries, 6:25878 (CONF-800939—2)
Wechsler, B.L., Program evaluation and review system for the Division of Energy Storage Systems. Final report, July 1, 1977-May 31, 1981, 6:25616 (DOE/ET/26704—7)
Weeks, J.R., *See* Bockris, J.O'M, 6:25243
Wegner, H.E., *See* Enge, H.A., 6:26593
Weiler, T., *See* Leveille, J.P., 6:26534
Weinberg, A.M., Three Mile Island in perspective: keynote address, 6:25540
Weinbrandt, R.M., Improved oil recovery by alkaline flooding in the Huntington Beach field, 6:25003 (DOE/BETC/IC—80/3(Vol.2), pp 9p, Paper 3)
Weiner, S., Solar energy legal bibliography: second update, 6:25231 (SERI/TR—744-876)
Weinstein, K.D., Enhanced utilization of used lubricating oil recycling process by-products, 6:25044 (DOE/BETC/IC—80/3(Vol.4), pp 9p, Paper 10)
Weinstein, S.D., Identification of product and material differences in active solar systems, 6:25322 (ANL-K—81-74)
Weinstock, H., *See* Tsai, C.L., 6:25922
Weis, J.J., *See* Alder, B.J., 6:26471
Weisenberg, I.J., *See* Streets, D.G., 6:26063
Weiss, J.M., *See* Schindler, R.H., 6:26486
Weiss, S.I., DOE's enrichment services--a long range policy, 6:25613
Weiss, S.J., *See* Burnet, G., 6:24929
Weissenberg, A., *See* Ammar, R., 6:26504
Weitl, F.L., *See* Moerlein, S.M., 6:26005
Welch, J.J., *See* Muller, R.A., 6:26071
Welch, M.J., *See* Moerlein, S.M., 6:26005
Weldon, D., Superconducting solenoid designed for 400 kJ at 25 kA under conditions of fast discharge and field reversal, 6:26695 (LA—8829-MS)
Wellman, P., H-Coal technology, progress toward commercialization, 6:24894
Wells, J.C., High-spin states and band structure in ^{76}Br, 6:26586
Wells, M., Absolutely constant incontestably stable architectural value scale, 6:25742
Wen, L., Thermal storage requirements for parabolic dish solar power plants, 6:25311
Wenblad, A., *See* Hultberg, H., 6:26252
Wenglarz, R.A., Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report, 6:25443 (EPRI-CS—1845)
Wenzel, W.A., *See* Clark, A.R., 6:26500
Wesche, T.A., Tongue River in Wyoming: a baseline fisheries assessment, Monarch to the state line, 6:26297 (ANL/LRP—10)
Wessel, H.B., *See* Racine, W.C., 6:25408
Wesson, T.C., Tertiary incentive crude oil program, 6:24980 (DOE/BETC/IC—80/3(Vol.1), pp 12p, Paper 5)
West, H.I. Jr., Dynamics of energetic electrons in the earth's outer radiation belt during 1968 as observed by the Lawrence Livermore National Laboratory's spectrometer on Ogo 5, 6:26442
Westbrook, S.R., *See* Stavinoha, L.L., 6:25060
Westlake, D.G., Introduction to hydrogen in alloys, 6:25900 (CONF-8006130—3)
Westmoreland, P.R., Pyrolysis of blocks of lignite, 6:24890
Wettlaufer, D.G., *See* Baltisberger, R.J., 6:24914
Wetzel, R.G., Dissolved organic matter and lake metabolism: biogeochemistry and controls of nutrient flux dynamics in lakes. Technical progress report, 1 July 1980-1 June 1981, 6:26207 (DOE/EV/01599—T1(Pt.1))
Publications of the Lawrence Lake ecosystem investigations, 6:26210 (DOE/EV/01599—T1(Pt.5))
Whealton, J.H., Expeditions Vlasov solver for computation of ion extraction from a plasma, 6:26665
Wheatley, J.C., *See* Allen, P.C., 6:26624
See Warkentin, P.A., 6:26479
Wheaton, F.W., Energy requirements and equipment for continuous processing of raw foods by gas-exchange, 6:25818
Wheeler, E.M., Design/development process for Underhill, a residence, 6:25366
Wheelock, T.D., *See* Chuang, K.C., 6:24867
See Markuszewski, R., 6:24866
Whipple, J.C., Plan for support of large-plant (post-CRBR) needs in large-leak sodium-water reaction area, 6:25523 (DOE/SF/70030—T19)
White, C.W., *See* Jellison, G.E. Jr., 6:26438
White, D., *See* McConville, G.T., 6:25981
White, G.B., *See* Albright, L.D., 6:25353
White, J.R., *See* Biswas, D., 6:25489
White, R.B., *See* Goldston, R.J., 6:26641
White, R.E., *See* Glover, C.J., 6:24977
Whitenight, D.K., *See* Rickles, R.N., 6:24941
Whitlow, S., *See* Thompson, M.E., 6:26262
Whitney, R.R., *See* Minehart, R.C., 6:26491
Whitson, M.E. Jr., *See* Randall, C.M., 6:25224, 6:25225
Whitten, J.L., *See* Cremaschi, P., 6:25927
Wichner, R.P., *See* Osborne, M.F., 6:25484
Wiczer, J.J., Direct bandgap, ionizing radiation insensitive photodiode structures, 6:26089 (SAND—81-0650C)
Wiedersich, H., *See* Pronko, P.P., 6:25895
Wiegert, R.G., *See* Hill, J. IV, 6:26217
Wiklander, G., *See* Farrell, E.P., 6:26186
See Tamm, C.O., 6:26349
Wilcox, T.P., MORSE-C: a CDC-7600 program designed to solve nuclear criticality problems by using the Monte-Carlo method, 6:26025 (UCID—18993)
Wilczynski, H., *See* Ammar, R., 6:26504
Wildman, G.C., *See* Neidlinger, H.H., 6:25028
Wiles, L.E., Water coning in porous media reservoirs for compressed air energy storage, 6:25572 (PNL—3470)
Wilhelmsen, S., *See* Alfheim, I., 6:26118
Wilhelmy, J.B., Nuclei far from stability using exotic targets, 6:26589 (LA-UR—81-1593)
Wilkes, R.J., *See* Ammar, R., 6:26504

Willcutt, G.J.E. Jr., *See* Knight, T.D., 6:25531
Williams, C.R., *See* Ikoku, C.U., 6:24996
Williams, D.C. Jr, *See* Nissan, E., 6:26160
Williams, F., *See* Golden, J., 6:25984
Williams, F.L., *See* Haaland, D.M., 6:25982
Williams, M.L., *See* Gilai, D., 6:25507
Willis, R.D., *See* Hurst, G.S., 6:26451
Willoughby, J.K., Improved computer-based system for managing information on enhanced oil recovery (EOR) and residual oil saturation (ROS), 6:24988 (DOE/BETC/IC—80/3(Vol.1), pp 14p, Paper 14)
Willson, W.G., *See* Knudson, C.L., 6:24878
Wilmsen, C.W., *See* Inoue, N., 6:25271
Wilson, C.R., *See* Kanehiro, B.Y., 6:25114
See Long, J.C.S., 6:26406
Wilson, D.B., Energy conservation in the petroleum and chemistry industry: ammonia process. Final report, August 19, 1976-May 15, 1978, 6:25198 (NP—1903403)
Wilson, J.W., Comparative class rates of return in the electric utility industry: a comparative study of electric rates charged to small business consumers. Final report, 6:25642 (PB—81-110322)
Wilson, R., *See* Koester, L.J., 6:26499
Wilson, R.E., Fixed-wake analysis of the Darrieus rotor, 6:25426 (SAND—81-7026)
Wilson, R.P. Jr., Feasibility of operating medium-speed diesel engines with coal derived liquids, 6:25439 (DOE/BETC/IC—80/3(Vol.4), pp 8p, Paper 27)
Wilson, T.D., Compilation of a handbook of environmental regulations affecting enhanced oil recovery, 6:25031 (DOE/BETC/IC—80/3(Vol.4), pp 4p, Paper 33)
Determination of EOR technology transfer requirements: a survey of the data needs of the oil industry and other users of EOR technical information, 6:25032 (DOE/BETC/IC—80/3(Vol.4), pp 9p, Paper 34)
Wilson, V., Solar industrial process heat: a study of applications and attitudes. Final report, 6:25350 (SERI/TR—98348-1)
Winans, R.E., *See* Hayatsu, R., 6:24907, 6:24919
Windawi, H., *See* Rothwarf, A., 6:25273
Winick, H., Wiggler and undulator magnets, 6:26073
Winschel, R.A., *See* Burke, F.P., 6:25972
Winslow, A.M., Adaptive-mesh zoning by the equipotential method, 6:26627 (UCID—19062)
Wipf, H., Neutron scattering measurements of low-temperature hydrogen tunneling in niobium, 6:26608 (BNL—28332)
Wise, J., *See* Jensen, D.A., 6:26505
Wise, J.L., *See* Asay, J.R., 6:25912
See Chhabildas, L.C., 6:25913
Wise, M.B., CP violation in the six-quark model, 6:26561
Wisenberg, G., In vivo quantitation of regional myocardial blood flow by positron-emission computed tomography, 6:26309
Wiser, W.H., Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)
Witherspoon, P.A., *See* Kanehiro, B.Y., 6:25114
See Long, J.C.S., 6:26406
Witt, J.M., *See* Gillett, J.W., 6:26179
Wittenberg, L.J., *See* Bockris, J.O'M, 6:25243
Wittig, C., *See* Fischer, T.A., 6:26035
Wolf, A.P., *See* Lambrecht, R.M., 6:26009
Wolf, C.A. Jr., Canada's voluntary industrial energy conservation programme, 6:25788 (CONF-7910214—, pp vp, 14p)
Wolf, C.P., Public interest groups, 6:25561
See Unseld, C.T., 6:25603
Wolf, D., Energies of <110> coincidence twist boundaries, stacking faults, and free surfaces in metal oxides with NaCl structure, 6:26613 (CONF-800765—9)
Wolf, R., Satellite graphics output station, 6:26721 (LA-UR—80-3716)
Wolff, G., *See* LaFontaine, G., 6:25293
Wolff, W.J., On-site quality control of insolation measurements, 6:25227
Wolfson, R.P., *See* Frey, B.C., 6:25813
Wolosewicz, R.M., *See* Singh, I., 6:25326
Wolsky, A.M., *See* Gaines, L.L., 6:25038
Wolter, W., *See* Ammar, R., 6:26504
Wong, M.J., *See* Wada, R.Y., 6:26154
Wong, S.L., *See* Germer, J.H., 6:25504
Wong, S.S.M., *See* Brody, T.A., 6:26606
Wood, K.V., *See* Mihursky, J.A., 6:25465
Wood, M.J., *See* Rippon, J.E., 6:26275
Wood, R.F., *See* Balluffi, R.W., 6:25242
See Jellison, G.E. Jr., 6:26438
Woodard, D., *See* Zarbakhsh, F., 6:26488
Woodfin, R.L., Results of full-scale turbine missile concrete impact experiments, 6:25538 (SAND—81-0353C)
Woods, L.E., *See* Elliott, E.T., 6:26180
Woodward, P.W., *See* Dooley, J.E., 6:25056
Woodworth, J.R., UV-laser-triggered switches, 6:26709 (SAND—81-0695C)
Woolsey, N.F., *See* Baltisberger, R.J., 6:24853, 6:24914
Wos, L., Hyperparamodulation: a refinement of paramodulation, 6:26626 (CONF-8007106—1)
Wosiek, B., *See* Ammar, R., 6:26504
Wrenn, W.B., Effects of temperature on bluegill reproduction and young-of-the-year standing stocks in experimental ecosystems, 6:26330
Wright, B.R., Investigation of fire-vulnerability-reduction effectiveness of fire-resistant diesel fuel in armored vehicular fuel tanks. Final report 25 Sep 79-30 Sep 80, 6:25051 (AD-A—090129)
Wright, R., Detailing the earth sheltered building, 6:25693 (CONF-800438—, pp 1-4)
See Mohn, E., 6:26258
Wright, R.F., Acid lakes and streams in the Galloway area, southwestern Scotland, 6:26264 (CONF-800365—, pp 248-249)
Acidified lake districts of the world: a comparison of water chemistry of lakes in southern Norway, southern Sweden, southwestern Scotland, the Adirondack Mountains of New York, and southeastern Ontario, 6:26285 (CONF-800365—, pp 377-379)
Input-output budgets of major ions at gauged catchments in Norway, 6:26265 (CONF-800365—, pp 250-251)
See Christophersen, N., 6:26277
See Johannessen, M., 6:26254
Wright, S., *See* Wright, R., 6:25693
Wright, T.F., *See* Lum, J.W., 6:25469
Wu, I.h., Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices, 6:25957
Wu, S.C., *See* Pung, T.C., 6:25974
Wu, S.L., Results from TASSO, 6:26086
Wu, Y.C.L., *See* Chapman, J.N., 6:25656
Wurstner, R.P., Pressure surge limiting valve for vacuum pump inlet piping, 6:26048
Wysk, R.A., Simulation model to evaluate the performance of windmill systems, 6:25431

Y

Yager, P.M., Inclusive kaon charge exchange in the triple-Regge region at high energies, 6:26487
Yamartino, R.J., Impact of aircraft emissions on air quality in the vicinity of airports. Volume I. Recent airport measurement programs, data analyses, and sub-model development. Final report Jan78-Jul 80, 6:26109 (AD-A—089962)
Yamasaki, S., *See* Hirata, H., 6:26228
Yan, N.D., *See* Dillon, P.J., 6:26249
Yang, C.L., *See* Fish, J.D., 6:25347
See Rabo, J.A., 6:25182
Yang, R.T., *See* Farber, G., 6:24865
See Shen, M., 6:25069
Yanko, W.H., *See* Styron, C.E., 6:24905
Yanniotis, S., *See* Schwartzberg, H.G., 6:25358
Yano, H., Plotting program for milestone schedules and status reports user's manual, 6:26725 (SAND—80-8053)
Yao, N.P., Status of nickel/zinc and nickel/iron battery technology for electric vehicle applications, 6:25584 (CONF-800612—6)
See Christianson, C.C., 6:25586
See Webster, W.H. Jr., 6:25878
Yarba, V., *See* Ammar, R., 6:26504
Yates, S.W., *See* Lee, I.Y., 6:26587
Yeager, J.G., Effects of moisture content on long-term survival and regrowth of bacteria in wastewater sludge, 6:26313
See Ward, R.L., 6:26321
Yeatts, L.B. Jr., *See* Griest, W.H., 6:26388
Yeh, G.T., *See* Crooks, E.A., 6:26287
Yellott, J., *See* Burgess, H., 6:25733
Yen, T.F., Some useful concepts derived from petroleum component properties for improved waterflooding studies, 6:25027 (DOE/BETC/IC—80/3(Vol.2), pp 10p, Paper 28)
See Tang, J.I.S., 6:24931
Yeung, E.S., *See* Sepaniak, M.J., 6:24913
Yim, Y.J., *See* Huettenhain, H., 6:24954
Yntema, J.L., Argonne tandem as injector to a superconducting linac, 6:26064 (CONF-8006123—3)
See Henning, W., 6:26070

Yoh, J.K., Results on the Y resonances from the CUSB group at CESR, 6:26515
Yokosawa, A., Review of N—N scattering, 6:26495
See Auer, I.P., 6:26489, 6:26490
Yoon, T., *See* Dankowych, J.A., 6:26492
Yoos, T.R. III, *See* Fuller, E.L. Jr., 6:24964
York, E.N., Initial neutron and gamma air-earth interface measurements. Final report, 6:26101 (AD—464381)
York, R.C., *See* Rock, S., 6:26511
Yost, F.E., Ecological investigations at power plant cooling lakes, reservoirs, and ponds: an annotated bibliography. Final report, 6:26324 (EPRI-EA—1874)
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)
Yost, T.M., *See* Gardner, J.F., 6:24854
Young, D.A., CTBN variability study. Final report, 6:25944 (BDX—613-2565)
Young, D.C., *See* Cronauer, D.C., 6:24858
Young, G.R., *See* Lee, I.Y., 6:26587
Young, R.T., *See* Jellison, G.E. Jr., 6:26438
Young, S.B., Ceramic heat-recovery systems for high-temperature furnaces, 6:25769 (CONF-800272—, pp 95-107)
Young, T.J., Aging characteristics of the SA1773 ceramic capacitor, 6:26051 (SAND—80-1132)
Yovanovitch, D., *See* Barish, B., 6:26517
Yu, H.J., *See* Smith, P.D., 6:25485
Yuhas, D., *See* Kupperman, D.S., 6:25934

Z

Zabransky, J., Techniques for assessing the wind energy resource in the Southeast region, 6:25416 (PNL—3669)
Zaccone, H., *See* Schindler, R.H., 6:26486
Zachary, L.W., Displacement discontinuity method applied to NDE-related stress problems, 6:26045 (IS-M—328)
Zalay, A.D., *See* Lissaman, P.B.S., 6:25427, 6:25428
Zalewski, E.F., Optogalvanic effect as a detector for intracavity atomic absorption in a cw dye laser, 6:26039
Zambrano, T.G., Assessing the local windfield with instrumentation, 6:25423 (PNL—3622)
Zanfino, C., *See* Dankowych, J.A., 6:26492
Zarbakhsh, F., Correlations at small relative momenta among protons produced in collisions of 1.8 GeV/nucleon ^{40}Ar with a KCl target, 6:26488
Zawacki, T.S., Research, development, and demonstration of a high-efficiency gas fired water heater. Final report 1979-80, 6:25724 (PB—81-113656)
Zdarko, R., *See* Rock, S., 6:26511
Zehner, H.H., *See* Pollock, D.W., 6:25115
Ziebarth, A.M., Potential problems of legal liability in the design, construction and ownership of an earth shelter, 6:25703 (CONF-800438—, pp 133-139)
Restrictive covenants: a barrier to earth sheltering, 6:25704 (CONF-800438—, pp 155-160)
Ziebarth, J.P., *See* Policastro, A.J., 6:25460
Zielinski, R.E., Resource assessment of the eastern gas shales, 6:25067 (MLM—2831(OP))
See Agarwal, A.K., 6:24869
Ziemer, S.E., *See* Policastro, A.J., 6:25459
Zimmer, J.W., *See* Zawacki, T.S., 6:25724
Zimmermann, H.D., *See* Henry, D.J., 6:26427
Ziock, H.J., *See* Minehart, R.C., 6:26491
Zoghbi, S.S., Investigations into agents for improving cell labeling with positron and gamma emitting radionuclides, 6:26306
Zornes, D.R., *See* Kleinschmidt, R.F., 6:25012
Zyskind, J., *See* Lockyer, N., 6:26502

SUBJECT INDEX

The subject index is based on the use of subject descriptors selected from a controlled thesaurus of terms. Subject descriptors and qualifiers (subheadings) are selected and presented in the following format:

SUBJECT DESCRIPTOR
Qualifier
Title, (supplementary information), citation number, (report number)

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed.

A

A1-1070 RESONANCES
Particle Production
Evidence for neutral A_1 and H resonances in charge exchange, 6:26492

ABANDONED SITES
Decontamination
Engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25122 (DOE/UMT—0103)
Summary of the engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25123 (DOE/UMT—0103S)
Radiometric Surveys
Engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25122 (DOE/UMT—0103)
Summary of the engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25123 (DOE/UMT—0103S)

AC SYSTEMS
See also EHV AC SYSTEMS
Electric Potential
Tester line voltage monitor, 6:25471 (BDX—613-2449)

ACCELERATOR BREEDERS
Reviews
Accelerator spallation reactors for breeding of fissile fuel and transmuting fission products, 6:26066 (BNL—29588)

ACCELERATOR FACILITIES
Nuclei far from stability using exotic targets, 6:26589 (LA-UR—81-1593)
Colliding Beams
Some comments on superhigh energy antiproton-proton colliders, 6:26074
Feasibility Studies
Some comments on superhigh energy antiproton-proton colliders, 6:26074

ACES
See QUARKS

ACETALDEHYDE
Synthesis
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)

ACETATES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977

ACETIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908

ACETYLENE
Chemical Preparation
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)

ACID CARBONATES
Chemical Reactions
Desulfurization of coal by oxidation in alkaline solutions, 6:24867 (IS-M—318)
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977

ACID ELECTROLYTE FUEL CELLS
Catalyst Supports
Non-noble catalysts and catalyst supports for phosphoric-acid fuel cells. 2nd quarterly report, December 1980-February 1981, 6:25668 (DOE/NASA/6229—2)
Design
Design considerations for vehicular fuel cell power plants, 6:25670 (LA-UR—81-1054)
Electrocatalysts
Non-noble catalysts and catalyst supports for phosphoric-acid fuel cells. 2nd quarterly report, December 1980-February 1981, 6:25668 (DOE/NASA/6229—2)
Gas Cooling
Evaluation of distributed gas cooling of pressurized PAFC for utility power generation. Second quarterly report, December 1980-February 1981, 6:25667 (DOE/NASA/0201—2)
Performance Testing
Evaluation of distributed gas cooling of pressurized PAFC for utility power generation. Second quarterly report, December 1980-February 1981, 6:25667 (DOE/NASA/0201—2)

ACID RAIN
Atmospheric Chemistry
Application of computer graphics to air quality data analysis. Technical report, 6:26155 (PB—81-113623)
Properties of acidified waters, 6:26117 (CONF-800365—)
Biological Effects
Deposition of nitrogen oxides to Scots pine (Pinus sylvestris L.), 6:26342 (CONF-800365—)
Effect of acid precipitation on tree growth, 6:26338 (CONF-800365—)
Effect of artificial acid rain on the spectral reflectance and photosynthesis of Scots pine seedlings, 6:26347 (CONF-800365—)
Effects of acid precipitation on biochemical activities in soil, 6:26335 (CONF-800365—)
Effects of acid precipitation on soil and forest. 6. Lysimeter experiment in greenhouse, 6:26353 (CONF-800365—)

Effects of acid precipitation on soil and forest. 8. Foliar nutrient concentrations in field experiments, 6:26355 (CONF-800365—)
Effects of acid precipitation on soil and forest. 9. Tree growth in field experiments, 6:26356 (CONF-800365—)
Effects of acid precipitation on soil and forest. 10. The effect of growth of Norway spruce on soil acidity by acid irrigation, 6:26357 (CONF-800365—)
Effects of simulated acidic rainfalls on yields of field-grown radishes and garden beets, 6:26331 (BNL—29433)
Influence of rainfall composition on the yield and quality of agricultural crops, 6:26334 (CONF-800365—)
Response of field-grown soybeans to acid precipitation alone and in combination with sulfur dioxide, 6:26346 (CONF-800365—)

Deposition
Preliminary characterization of three lake basins sensitive to acid precipitation in Nova Scotia, Canada, 6:26257 (CONF-800365—)

Environmental Effects
Acid groundwater in southwestern Sweden, 6:26252 (CONF-800365—)
Acid lakes and streams in the Galloway area, southwestern Scotland, 6:26264 (CONF-800365—)
Acid precipitation and soil buffering capacity, 6:26336 (CONF-800365—)
Acid precipitation, plant nutrients and forest growth, 6:26337 (CONF-800365—)
Acid precipitation and ecological effects in Northern California, 6:26127 (CONF-800365—)
Acid precipitation: the biotic response in Florida lakes, 6:26363 (CONF-800365—)
Acidification of freshwaters: a large scale titration, 6:26248 (CONF-800365—)
Acidification of Danish soft-water lakes, 6:26204 (CONF-800365—)
Acidification of Belgian moorland pools by acid sulfur-rich rainwater, 6:26263 (CONF-800365—)
Alberta oil sands environmental research program. An overview, 6:26132 (CONF-800365—)
Aluminum mobilization in acid stream environments, Great Smoky Mountains National Park, USA, 6:26251 (CONF-800365—)
Atmospheric inputs to three Adirondack lake watersheds, 6:26268 (CONF-800365—)
Comparison of lead, manganese, and zinc transport in three Adirondack lake watersheds, New York, 6:26269 (CONF-800365—)
Ecological impact of acid precipitation (Lead abstract), 6:26332 (CONF-800365—)
Effects of simulated rain on the effluent from lysimeters with acid, shallow soil, rich in organic matter, 6:26139 (CONF-800365—)
Effects of experimental acidification on soil organism populations and decomposition, 6:26348 (CONF-800365—)
Effects of acid precipitation on soil and forest. 1. Methods of the field experiments, 6:26350 (CONF-800365—)
Effects of acid precipitation on soil and forest. 5. Release and loss of nutrients from a Norwegian forest soil due to artificial rain of varying acidity, 6:26188 (CONF-800365—)
Evidence of acidification of rivers of Eastern Canada, 6:26262 (CONF-800365—)
Framework for the integrated lake-watershed acidification study, 6:26266 (CONF-800365—)
Hydrogen, sulphur and nitrogen budgets in soils and catchments, 6:26275 (CONF-800365—)
Impact of land-use on the chemical composition of rain and snow in northern Minnesota, 6:26182 (CONF-800365—)
Impact of acid precipitation on forest canopies and soils in the northeastern US, 6:26343 (CONF-800365—)
Impact of acid precipitation on diatoms and chemistry of Dutch moorland pools, 6:26364 (CONF-800365—)
Physiology of fish in acid waters, 6:26360 (CONF-800365—)
Role of clouds in atmospheric transport of mercury and other pollutants: 1. The link between acid precipitation, poorly buffered waters, mercury and fish. 2. The role of cloud water in atmospheric transport, 6:26133 (CONF-800365—)
Sensitivity of the United States environment to acid precipitation, 6:26123 (CONF-800365—)
Soil resampling and pH measurements after an 18-year period in Ontario, 6:26184 (CONF-800365—)
Some aspects of acidification in southern Ontario, 6:26249 (CONF-800365—)
Sources of acidity in three lakes acidified during snowmelt, 6:26270 (CONF-800365—)
Sulfate dynamics in natural environments. Preliminary results from a case study (Norway), 6:26140 (CONF-800365—)
Susceptibility of aquatic and terrestrial resources of Minnesota, Wisconsin, and Michigan to impacts from acid precipitation: informational requirements, 6:26122 (CONF-800365—)
Widespread and diverse changes in the biota of North American lakes and rivers coincident with acidification, 6:26340 (CONF-800365—)

Environmental Transport
Wind tunnel studies of dry deposition of SO_2 and H_2SO_4 aerosols, 6:26121 (CONF-800365—)

Ionic Composition
Input-output budgets of major ions at gauged catchments in Norway, 6:26265 (CONF-800365—)

Mathematical Models
Framework for the integrated lake-watershed acidification study, 6:26266 (CONF-800365—)

Meetings
Ecological impact of acid precipitation (Lead abstract), 6:26332 (CONF-800365—)

Monitoring
Acid precipitation in Florida (USA): results of a statewide monitoring network, 6:26125 (CONF-800365—)
Comparative composition of continential and Nova Scotian precipitation, 6:26129 (CONF-800365—)
Map of areas potentially sensitive to wet and dry acid deposition in the United States, 6:26130 (CONF-800365—)

Regional Analysis
Acid precipitation in the Keweenaw Peninsula of Michigan's Upper Peninsula, 6:26120 (CONF-800365—)

Research Programs
Capabilities for research on acid rain, 6:26113 (BNL—29741)

Seasonal Variations
Acidity of Antarctic snow: a natural reference level for acid rains, 6:26181 (CONF-800365—)
Snow pack storage and ion release, 6:26190 (CONF-800365—)
Sulfur distribution and flux in two forested watersheds in eastern Tennessee, 6:26256 (CONF-800365—)

Soil Chemistry
Properties of acidified waters, 6:26117 (CONF-800365—)

ACIDIFICATION

Biological Effects
Acid stress in trout from a dilute mountain stream, 6:26372 (CONF-800365—)
Acidification: effects on freshwater fish, 6:26339 (CONF-800365—)
Does the change of predator system contribute to the biotic development in acidified lakes, 6:26371 (CONF-800365—)
Effect of acid pH on sodium and chloride balance in an inhabitant of acid freshwaters: the waterbug Corixa punctata (Illig.) (Insecta, Hemiptera), 6:26382 (CONF-800365—)
Effects of low pH on hatching of Atlantic salmon eggs, 6:26377 (CONF-800365—)
Effects of acidity on decomposition of organic matter in aquatic environments, 6:26282 (CONF-800365—)
Fish and freshwater chemistry, 6:26359 (CONF-800365—)
Genetic variation in acid tolerance in brown trout, 6:26368 (CONF-800365—)
Growth and survival of fingerlings in acidic water, 6:26369 (CONF-800365—)
Physiological responses to acid water in fish. 1. Effects from changes in plasma osmolality and ion concentration on heart ventricle water content and intracellular concentrations of K^+ and taurine in the brown trout (Salmo trutta L.), 6:26383 (CONF-800365—)
Physiological responses to acid water in fish. 2. Effects of acid water on metabolism and gill ventilation in brown trout, Salmo trutta L., and brook trout, Salvelinus fontinalis Mitchill, 6:26384 (CONF-800365—)

Physiology of fish in acid waters, 6:26360 (CONF-800365—)
Studies on freshwater fish populations: effects of acidification on reproduction, population structure, growth and food selection, 6:26381 (CONF-800365—)
Biological Indicators
Alberta oil sands environmental research program. An overview, 6:26132 (CONF-800365—)
Environmental Effects
Acidification impacts on lakes in the Sudbury, Ontario, Canada area, 6:26358 (CONF-800365—)
Acidified lake districts of the world: a comparison of water chemistry of lakes in southern Norway, southern Sweden, southwestern Scotland, the Adirondack Mountains of New York, and southeastern Ontario, 6:26285 (CONF-800365—)
Decomposition and exchange processes in acidified lake sediment, 6:26279 (CONF-800365—)
Ecologicall effects of experimental acidification on a stream ecosystem, 6:26387 (CONF-800365—)
Ecology of acid streams draining forested and non-forested catchments in Scotland, 6:26280 (CONF-800365—)
Effects of artificial acidification with sulfuric acid on soil chemistry in a Scots pine forest, 6:26186 (CONF-800365—)
Effects of acid precipitation on soil and forest. 2. Atmosphere-vegetation interactions, 6:26351 (CONF-800365—)
Effects of acid precipitation on soil and forest. 4. Leaching of plant nutrients, 6:26352 (CONF-800365—)
Effects of acid precipitation on soil and forest. 7. Soil animals, 6:26354 (CONF-800365—)
Effects of acidification on the dynamics of allochthonous leaf material and benthic invertebrate communities in running waters, 6:26367 (CONF-800365—)
Experimental acidification of a whole lake: a test of the oligotrophication hypothesis, 6:26206 (CONF-800365—)
Fishkills in two moderately acid lakes due to high aluminum concentration, 6:26370 (CONF-800365—)
Lake acidification, fish damage, and utilization of outfields. A comparative survey of six highland areas, southeastern Norway, 6:26386 (CONF-800365—)
Loss of fish populations in Southern Norway. Dynamics and magnitude of the problem, 6:26385 (CONF-800365—)
pH level and food organisms for fish: studies of 1000 lakes in Norway, 6:26376 (CONF-800365—)
Phytoplankton and zooplankton in acidified lakes in South Norway, 6:26379 (CONF-800365—)
Potential for acid precipitation damage to aquatic ecosystems of the Sierra Nevada, California (USA), 6:26281 (CONF-800365—)
River Hoegvadsan liming project: a presentation, 6:26365 (CONF-800365—)
Forecasting
Acidification of freshwaters: a large scale titration, 6:26248 (CONF-800365—)
Mathematical Models
Acid precipitation, throughfall chemistry and canopy processes, 6:26189 (CONF-800365—)

ACRYLAMIDE
Polymerization
Exploratory study of reactivity in organic compounds subjected to shock loading, 6:25993 (SAND—81-1386C)

ACRYLATES
Rheology
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
Synthesis
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
Viscosity
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))

ACRYLIC ACID ESTERS
Rheology
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
Synthesis
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
Viscosity
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))

ACRYLIC POLYMERS
See POLYACRYLATES

ACTIVATED CARBON
Regeneration
Energy-efficient regeneration of granular activated carbon, 6:25801 (DOE/TIC—11124)
Sorptive Properties
Adsorption on inorganic materials. 8. Adsorption of iodide on AgCl-filled carbon, 6:25973

ACTIVATED SLUDGE PROCESS
Biological removal of organic constituents in high-Btu coal gasification wastewaters, 6:24924 (CONF-8006171—1)

ACTIVATION ANALYSIS
Corrections
Identification of noise in linear data sets by factor analysis, 6:25966 (DOE/EV/10403—2)
Errors
Identification of noise in linear data sets by factor analysis, 6:25966 (DOE/EV/10403—2)

ACTIVITY COEFFICIENT
See REACTION KINETICS

ADAMANTANE
Chemical Reactions
Exploratory study of reactivity in organic compounds subjected to shock loading, 6:25993 (SAND—81-1386C)

ADHESIVES
Stability
High temperature bonding techniques for solar cell array. Final report Mar 76-Jun 77, 6:25293 (AD—B028686/4)

AEROSOLS
See also RADIOACTIVE AEROSOLS
Air Pollution
Method for estimating the challenge to an air-cleaning system resulting from an accidental explosive event, 6:25166 (CONF-801038—23)
Inhalation
Aerosol factors affecting respiratory deposition, 6:26392 (UR—3490-2026)
Quantitative Chemical Analysis
Analysis of organic micropollutants in aerosols, 6:26118 (CONF-800365—)

AFTER-HEAT REMOVAL
Analysis of thermal conductivity probes for high temperature applications (LMFBR), 6:25537 (SAND—81-0106)
Forced Convection
Calculational method for combined natural circulation and forced-convection flow in a channel (LMFBR), 6:25518 (CONF-800723—26)
Mathematical Models
Study of turbulent natural-circulation flow and low-Prandtl-number forced-convection flow (LMFBR), 6:25519 (CONF-800723—27)
Natural Convection
Calculational method for combined natural circulation and forced-convection flow in a channel (LMFBR), 6:25518 (CONF-800723—26)
Study of turbulent natural-circulation flow and low-Prandtl-number forced-convection flow (LMFBR), 6:25519 (CONF-800723—27)

AGED
See ELDERLY PEOPLE

AGRICULTURAL RESIDUES
See AGRICULTURAL WASTES
AGRICULTURAL WASTES
See also MANURES
Combustion
Development of a concentric-vortex agricultural-residue furnace, 6:25277
Energy Recovery
Energy recovery from industrial and vegetable wastes, 6:25774 (CONF-800272—)
Gasification
Thermal conversion of solid wastes and biomass, 6:25183
Harvesting
Economic and energy analysis of potential corn-residue harvesting systems, 6:25276
Hydrolysis
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw, 6:25406 (DOE/ID/12051—T1)
Liquefaction
Thermal conversion of solid wastes and biomass, 6:25183
Pyrolysis
Thermal conversion of solid wastes and biomass, 6:25183
AGRICULTURE
See also DAIRY INDUSTRY
Meetings
Agri-energy roundtable, 6:25289
Agricultural energy. Volume 2. Biomass energy crop production, 6:25275
Waste Heat Utilization
Use of low-grade reject heat (Book chapter), 6:25618
AIR
See also EARTH ATMOSPHERE
Radiochemical Analysis
Simple and effective method for measurement of HTO and HT in environmental air, 6:25975
Separation Processes
Air separation by the Moltox process. Interim final report, 6:25797 (DOE/CS/40287—T1)
AIR CLEANING SYSTEMS
Performance
Permeation cascades for the separation of krypton and xenon from nuclear reactor atmospheres, 6:25567
Separation of krypton and xenon by selective permeation, 6:25516
AIR CONDITIONERS
See also SOLAR AIR CONDITIONERS
Heat Recovery Equipment
Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980, 6:25720 (NBSIR—80-2145(DOE))
AIR FILTERS
Efficiency
Electrostatic air filters generated by electric fields, 6:26162 (UCRL—84878)
Electrostatic Precipitators
Electrostatic air filters generated by electric fields, 6:26162 (UCRL—84878)
Pressure Drop
Electrostatic air filters generated by electric fields, 6:26162 (UCRL—84878)
AIR HEATERS
Corrosion
Summary of discussion-group sessions on use of additives in coal-fired plants, 6:24963 (EPRI-WS—80-127)
Plugging
Summary of discussion-group sessions on use of additives in coal-fired plants, 6:24963 (EPRI-WS—80-127)
AIR POLLUTION
See also INDOOR AIR POLLUTION
STATIONARY POLLUTANT SOURCES
Absorption
Sorption of pollutant gases by soils. Final report, December 1, 1974-November 30, 1980, 6:26191 (DOE/EV/02530—17)
Atmospheric Chemistry
Analysis of organic micropollutants in aerosols, 6:26118 (CONF-800365—)
Description of the turbulent fragmentation of a puff in the turbulent flow with the large Reynold's numbers, 6:26104 (BNL—51385)
Bibliographies
Nitrogen oxide air pollution: biological effects. 1964-August, 1980 (citations from the NTIS data base). Report for 1964-Aug 80, 6:26390 (PB—81-800203)
Biological Effects
Influence of a polluted atmosphere on cuticle degradation in Scots pine (Pinus sylvestris), 6:26341 (CONF-800365—)
Data Analysis
Application of computer graphics to air quality data analysis. Technical report, 6:26155 (PB—81-113623)
Deposition
Effects of a Scots pine (Pinus sylvestris L.) canopy on the chemical composition and deposition pattern of precipitation, 6:26138 (CONF-800365—)
Relationship between relief and deposition of some organic and inorganic contaminants in snow of northern Bavaria, F.R.G., 6:26131 (CONF-800365—)
Removal of sulphur and nitrogen compounds from the atmosphere in rain and by dry deposition, 6:26116 (CONF-800365—)
Diffusion
Analytical and experimental assessment of highway impact on air quality: data analysis and model evaluation. Research report (final) Sep 74-21 Jan 80, 6:26159 (PB—81-114738)
Distribution
Brownian-motion model of pollutant-concentration distributions. Study on statistics and environmental factors in health (SIMS), 6:26145 (DOE/EV/10428—11)
Environmental Effects
Air pollutants as additional stress factors of conifers under northern conditions (Finland), 6:26345 (CONF-800365—)
Collection and retention of atmospheric pollutants by vegetation, 6:26333 (CONF-800365—)
Reconstruction of species composition of stands as a necessary condition for the survival of the Niepolomice Forest (Poland), 6:26344 (CONF-800365—)
Environmental Impacts
Program report for FY 1980. Atmospheric and Geophysical Sciences Division of the Physics Department, 6:26161 (UCRL—51444-80)
Environmental Transport
Atmospheric transport of pollutants, 6:26115 (CONF-800365—)
Contribution from long-range atmospheric transport to the heavy metal pollution of surface soil, 6:26119 (CONF-800365—)
Program report for FY 1980. Atmospheric and Geophysical Sciences Division of the Physics Department, 6:26161 (UCRL—51444-80)
Forecasting
Modeling and analysis of air-quality data. Technical report No. 43, 6:26144 (DOE/EV/10428—8)
Information Systems
Source Test Data (SOTDAT) System information, 6:26107 (PB—81-120578)
Mathematical Models
Application of photochemical models. Volume III. Recent sensitivity tests and other applications of the LIRAQ model. Final report, 6:26154 (PB—81-112898)
Metals
Atmospheric deposition of trace elements in Norway, 6:26124 (CONF-800365—)
Monitoring
Continuous monitoring of airborne pollutants, 6:26137 (CONF-800365—)
Deposition of air pollutants in Norway, 6:26126 (CONF-800365—)
Preliminary evaluation of DOE-NEPA monitoring system, 6:26147 (DOE/EV/10475—1)
Multi-Element Analysis
Internal-standard method for multi-element neutron activation analysis of airborne particulates in Taiwan, 6:25974
Point Pollutant Sources
The ELSTAR stationary source emissions data preprocessor. Software, 6:26157 (PB—81-114381)

Regional Analysis
Map of areas potentially sensitive to wet and dry acid deposition in the United States, 6:26130 (CONF-800365—)
Standards
An evaluation of air pollution abatement relaxation strategies for Tennessee during periods of pending or actual energy emergencies. (Tennessee State science, engineering, and technology project). Final report, 6:25605 (PB—81-114605)
Statistical Models
Remarks on the description of the statistical features of the turbulent diffusion of a puff, 6:26105 (BNL—51386)
Washout
Removal of sulphur and nitrogen compounds from the atmosphere in rain and by dry deposition, 6:26116 (CONF-800365—)

AIR POLLUTION CONTROL
Controlling airborne particles, 6:26106 (PB—81-114969)
Decision Making
Community environmental education: three models of organization for PSD Set II. Final report, 6:25606 (PB—81-118721)
Education
Community environmental education: three models of organization for PSD Set II. Final report, 6:25606 (PB—81-118721)
Manuals
Volatile organic compound (VOC) species data manual. Second edition, 6:26175 (PB—81-119455)
Reviews
Status of pollution-control technologies for industrial boilers, 6:26063 (CONF-800608—7)
Standards
Automobile and light-duty truck surface coating operations-background information for promulgated standards. Final report, 6:26156 (PB—81-113920)

AIR QUALITY
Mathematical Models
Modeling and analysis of air-quality data. Technical report No. 43, 6:26144 (DOE/EV/10428—8)
The ELSTAR stationary source emissions data preprocessor. Software, 6:26157 (PB—81-114381)

AIR SOURCE HEAT PUMPS
Energy Efficiency
Programmer's manual for the DOEHPE (DOE Heat Pump Efficiency) program, 6:25807 (SAI—444-80-533-LJ)
Performance
Programmer's manual for the DOEHPE (DOE Heat Pump Efficiency) program, 6:25807 (SAI—444-80-533-LJ)

AIRCRAFT
Air Pollution
Impact of aircraft emissions on air quality in the vicinity of airports. Volume I. Recent airport measurement programs, data analyses, and sub-model development. Final report Jan78-Jul 80, 6:26109 (AD—A-089962)
Fuel Substitution
Overview of aviation energy programs and supply problems, 6:25758
Gas Turbine Engines
An automatic isokinetic sampler for particulate emissions from aircraft gas turbine engines. Final report Feb 75-Jun 78, 6:25852 (AD—A-090280)
The response of turbine engine rotors to interference rubs, 6:25855 (AD—A-090408)
USAF aircraft engine emission goals: a critical review. Final report Sep 78-Jun 79, 6:25853 (AD—A-090282)

AIRCRAFT FUELS
See AVIATION FUELS

ALABAMA
Coastal Regions
The economic and environmental structure of Alabama's coastal region, part II. Environmental structure, 6:25601 (PB—81-113391)
Industry
Waste disposal inventory for Mississippi-Alabama coastal counties, 6:26160 (PB—81-118994)
Input-Output Analysis
The economic and environmental structure of Alabama's coastal region, part II. Environmental structure, 6:25601 (PB—81-113391)
Wind Power
Techniques for assessing the wind energy resource in the Southeast region, 6:25416 (PNL—3669)

ALARM DOSEMETERS
See RADIATION MONITORS

ALARM SYSTEMS
Speech Synthesizers
Enhancement of a radiation safety system through the use of a microprocessor-controlled speech synthesizer, 6:26076 (CONF-801103—59)

ALASKA
Geochemical Surveys
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)

ALASKA GAS PIPELINE
Construction
Quarterly report no. 5 to the President and Congress on the construction of the Alaska Natural Gas Transportation System, 6:25076 (PB—81-115123)

ALBITE
Thermodynamic Properties
Thermodynamic properties of crystals and melts based on calorimetric data and plagioclass-melt equilibria in the system albite-anorthite-diposide, 6:26427 (DOE/ER/10765—T1)

ALCOHOL FUELS
See also ETHANOL FUELS
METHANOL FUELS
Economic Analysis
Economic and energy analysis of potential corn-residue harvesting systems, 6:25276
Energy Analysis
Economic and energy analysis of potential corn-residue harvesting systems, 6:25276
Performance
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))

ALCOHOLS
See also BUTANOLS
ETHANOL
METHANOL
2-METHYLPROPANOL
PROPANOLS
Solubility
Micellar-flood research: biopolymers, interfacial and phase behavior, and competitive adsorbates, 6:25020 (DOE/BETC/IC—80/3(Vol.2))

ALGAE
See also DIATOMS
PHYTOPLANKTON
Aquaculture
Biomass production by freshwater and marine macrophytes, 6:25283
Biological Adaptation
Limitations on the use of microcosms for predicting algal response to nutrient enrichment in lotic systems, 6:26239
Population Density
Littoral-pelagial interactions: the role of dissolved humic materials, 6:26209 (DOE/EV/01599—T1(Pt.4))
Population Dynamics
Responses of aquatic microcosms to acute mortality, 6:26234

ALKALI METAL COMPOUNDS
Removal
Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)

ALKANES
See also ADAMANTANE
DECANE
DODECANE

METHANE
Phase Studies
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))

ALKENOIC ACIDS
See CARBOXYLIC ACIDS

ALLOY 800
See INCOLOY 800

ALLOY-HT-9
Tensile Properties
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)

ALLOYS
Deformation
Deformation microstructures and mechanical equations of state, 6:25898 (CONF-801148—6)
Electronic Structure
Introduction to hydrogen in alloys, 6:25900 (CONF-8006130—3)
Mechanical Properties
Introduction to hydrogen in alloys, 6:25900 (CONF-8006130—3)
Microstructure
Deformation microstructures and mechanical equations of state, 6:25898 (CONF-801148—6)
Phase Studies
Introduction to hydrogen in alloys, 6:25900 (CONF-8006130—3)

ALTERNATE FUELS
See FUEL SUBSTITUTION
SYNTHETIC FUELS

ALUMINA
See ALUMINIUM OXIDES

ALUMINIUM
Activation Analysis
Determination of uranium and thorium in semiconductor memory materials by high fluence neutron activation analysis, 6:25965 (CONF-810682—3)
Biological Effects
Toxic effects of aluminum on the brown trout, Salmo trutta L., 6:26373 (CONF-800365—)
Buffers
Aluminum, a buffer in acidic waters, 6:26253 (CONF-800365—)
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Environmental Effects
Aqueous speciation of aluminum in the Adirondack region of New York State, USA, 6:26250 (CONF-800365—)
Environmental Transport
Fishkills in two moderately acid lakes due to high aluminum concentration, 6:26370 (CONF-800365—)
Toxic effects of aluminum on the brown trout, Salmo trutta L., 6:26373 (CONF-800365—)
Ion Collisions
Pulsed laser irradiation of Al, 6:25928
Laser Radiation
Pulsed laser irradiation of Al, 6:25928
Lattice Vibrations
Energetics of hydrogen in aluminum, 6:25923
Materials Recovery
Recovery of aluminum and other metal values from fly ash (Patent), 6:24932
Melting
Pulsed laser irradiation of Al, 6:25928
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
Particle Mobility
Aluminum mobilization in acid stream environments, Great Smoky Mountains National Park, USA, 6:26251 (CONF-800365—)
Photoemission
Photoemission measurements for low energy x-ray detector applications, 6:26609 (LA-UR—81-1712)
Production
Energy savings through the use of an improved aluminum reduction-cell cathode. Technical progress report, April 1, 1980-June 30, 1980, 6:25796 (DOE/CS/40215—T1)
Solution Heat
Energetics of hydrogen in aluminum, 6:25923
Strain Rate
Thermal-viscous model for heterogeneous yielding in aluminum, 6:25915 (SAND—81-0108C)
Superconductivity
Vortex unbinding in superconducting thin films, 6:26618 (CONF-800561—4)
Tensile Properties
Thermal-viscous model for heterogeneous yielding in aluminum, 6:25915 (SAND—81-0108C)
Toxicity
Aluminum toxicity to fish as related to acid precipitation and Adirondack surface water quality, 6:26361 (CONF-800365—)
Fishkills in two moderately acid lakes due to high aluminum concentration, 6:26370 (CONF-800365—)
Physiological responses to acid water in fish. 2. Effects of acid water on metabolism and gill ventilation in brown trout, Salmo trutta L., and brook trout, Salvelinus fontinalis Mitchill, 6:26384 (CONF-800365—)

ALUMINIUM 27 TARGET
Pion Reactions
Inclusive reactions of pions on nuclei, 6:26575

ALUMINIUM ALLOYS
Activation Analysis
Determination of uranium and thorium in semiconductor memory materials by high fluence neutron activation analysis, 6:25965 (CONF-810682—3)
Cracks
Remaining fatigue lifetime prediction for retirement-for-cause in aluminum alloys, 6:25906 (IS-M—315)
Crystallography
Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices, 6:25957
Electron Diffraction
Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices, 6:25957
Fatigue
Remaining fatigue lifetime prediction for retirement-for-cause in aluminum alloys, 6:25906 (IS-M—315)
Fracture Properties
Development of fracture toughness measurement capability by ultrasound. Final report, 6:26044 (BDX—613-2625)
Hyperfine Structure
Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ under extermal magnetic fields, 6:25897 (CONF-801134—16)

ALUMINIUM OXIDES
Catalytic Effects
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)
Electric Conductivity
Special Purpose Materials annual progress report, October 1, 1979, 6:25902 (DOE/ER—0048/1)
Materials Recovery
Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980, 6:24929 (IS—4773)
Assessment of the environmental impact of power plant fly ash, 6:24933 (IS-M—309)
Physical Radiation Effects
Special Purpose Materials annual progress report, October 1, 1979, 6:25902 (DOE/ER—0048/1)

Thermal Conductivity
Thermal conductivity measurements on high-temperature fibrous insulations by the hot-wire method (25 to 1600°C), 6:25684

ALUMINIUM SILICATES
See also KAOLINITE
Aging
Ceramic regenerator systems development program. Final report, 6:25862 (DOE/NASA/0008—12)
Corrosion
Ceramic regenerator systems development program. Final report, 6:25862 (DOE/NASA/0008—12)
Wear
Ceramic regenerator systems development program. Final report, 6:25862 (DOE/NASA/0008—12)

AMEBA
See AMOEBA

AMERICIUM
Environmental Transport
Americium migration in basalt and implications to repository risk analysis, 6:25164 (CONF-8010130—8)

AMERICIUM 241
Radioecological Concentration
Relative mobilization of zinc, cerium, and americium from sediment in an aquatic microcosm, 6:26293

AMES LABORATORY
Radiation Monitoring
Environmental monitoring at Ames Laboratory: calendar year 1980, 6:26167 (IS—4768)

AMES WET OXIDATION PROCESS
Comparative Evaluations
Evaluation of chemical coal cleaning processes, 6:24954

AMINES
See also METHYLENE BLUE
QUATERNARY COMPOUNDS
RHODAMINES
UROTROPIN
Labelling
Synthesis and brain uptake of carbon-11 phenethylamine, 6:26008
Radiochemistry
Synthesis and brain uptake of carbon-11 phenethylamine, 6:26008

AMINOGLYCIDES
See AMINES

AMMONIA
Annual Variations
Annual nutrient cycles in a marine microcosm, 6:26242
Foliar Uptake
Collection and retention of atmospheric pollutants by vegetation, 6:26333 (CONF-800365—)
Production
Energy conservation in the petroleum and chemistry industry: ammonia process. Final report, August 19, 1976-May 15, 1978, 6:25198 (NP—1903403)
Recovery
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))
Vapor Condensation
Ammonia condensation experiments at Oak Ridge National Laboratory, 6:25313 (CONF-810622—1)

AMMONIA FUEL CELLS
Hydrogen Generators
Characteristics of an NH_3-air fuel cell system for vehicular applications, 6:25671 (LBL—12754)
Performance
Characteristics of an NH_3-air fuel cell system for vehicular applications, 6:25671 (LBL—12754)

AMMONIUM NITRATES
Biological Effects
Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238

AMMONIUM SULFATES
Standards
Ammonium sulfate manufacture - background information for promulgated emission standards. Final report, 6:26174 (PB—81-118747)

AMOEBA
Animal Growth
Effects of thermal additions on the presence of pathogenic and nonpathogenic free-living amoebae at the Savannah River Laboratory, 6:26294 (DP-MS—81-64)
Food Chains
Microbial trophic structure and habitable pore space in soil, 6:26180
Population Dynamics
Effects of thermal additions on the presence of pathogenic and nonpathogenic free-living amoebae at the Savannah River Laboratory, 6:26294 (DP-MS—81-64)

ANAEROBIC DIGESTION
Comparative Evaluations
Engineering economic analysis of biomethanation of pyrolysis gas, 6:25181 (DOE/CE/20098—1)
Geothermal Process Heat
Kelley Hot Spring Geothermal Project: Kelly Hot Spring Agricultural Center conceptual design, 6:25409 (GT—27041-4)
Optimization
Enhancement of methane gas production using an industrial waste in anaerobic digestion, 6:25179 (CONF-801210—26)
Pilot Plants
Refuse conversion to methane (RefCOM): a proof-of-concept anaerobic digestion facility, 6:25187

ANHYDRITE
Thermal Conductivity
Thermal conductivity of polyhalite and anhydrite from the site of the proposed waste isolation pilot plant, 6:26430 (SAND—81-0856)

ANIMAL SHELTERS
Exhaust Gases
Solar energy utilization in a greenhouse/animal shelter combination, 6:25811
Geothermal Space Heating
Kelley Hot Spring Geothermal Project: Kelly Hot Spring Agricultural Center conceptual design, 6:25409 (GT—27041-4)

ANL
(Argonne National Laboratory.)
Radioactive Effluents
Radionuclides in liquid effluents from Argonne National Laboratory: an example of monitoring for a multidisciplinary nuclear laboratory, 6:26292

ANNELIDS
Reproduction
Effects of acid precipitation on soil and forest. 7. Soil animals, 6:26354 (CONF-800365—)

ANNUAL CYCLE ENERGY SYSTEM
Efficiency
Annual cycle energy system, 6:25711 (CONF-810672—16)
Field Tests
Annual cycle energy system, 6:25711 (CONF-810672—16)

ANNUAL ENERGY STORAGE
Feasibility Studies
Longterm solar heat storage in an underground water cistern retrofitted with thermal insulation. Final technical report, May 15, 1979-March 31, 1981, 6:25380 (DOE/R5/10106—3)

ANORTHOSITES
Thermodynamic Properties
Thermodynamic properties of crystals and melts based on calorimetric data and plagioclass-melt equilibria in the system albite-anorthite-diposide, 6:26427 (DOE/ER/10765—T1)

ANTARCTICA
Acid Rain
Acidity of Antarctic snow: a natural reference level for acid rains, 6:26181 (CONF-800365—)

ANTARES FACILITY
Alignment
Design and fabrication of a high-damage threshold infrared Smattt interferometer, 6:26696 (LA-UR—81-1395)
ANTENNAS
See also RADIO EQUIPMENT
Transients
Direct time-domain techniques for transient radiation and scattering from wires, 6:26625
ANTHRACENE
Comparative Evaluations
Evaluation of the donor ability of coal liquefaction solvents, 6:24874
ANTIMONY
Activation Analysis
Simultaneous determination of antimony and chlorine in synthetic rubbers by 14-MeV neutron-activation analysis, 6:25971 (SAND—81-0156C)
ANTIMONY TELLURIDES
Magnetic Properties
Neutron diffraction study of USbsub(1-x)Tesub(x) solid solutions, 6:25963
Neutron Diffraction
Neutron diffraction study of USbsub(1-x)Tesub(x) solid solutions, 6:25963
ANTINEUTRINO-NUCLEON INTERACTIONS
Charged-Current Interactions
Recent results from the CFRR neutrino experiment at Fermilab, 6:26517
ANTINEUTRINOS
Reactor antineutrino spectra and their application to antineutrino-induced reactions II, 6:25501 (HEDL-SA—2303-FP)
ANTIPROTON BEAMS
Beam Production
Some comments on superhigh energy antiproton-proton colliders, 6:26074
ANTIREFLECTION COATINGS
Performance
Method for evaluation of antireflection coatings, 6:25270
ANTRIM SHALES
See BLACK SHALES
ANTS
See INSECTS
APARTMENT BUILDINGS
Energy Conservation
Evaluation of the conservation potential of a refit energy management system (using a power line subcarrier) in a large, high-rise apartment complex, 6:25690 (BNL—51299)
Energy Management Systems
Evaluation of the conservation potential of a refit energy management system (using a power line subcarrier) in a large, high-rise apartment complex, 6:25690 (BNL—51299)
Solar Architecture
Solar housing in Italy: a project in Pisa, 6:25372
Solar Space Heating
Solar housing in London, 6:25369
Solar housing in Italy: a project in Pisa, 6:25372
Solar Water Heating
Solar housing in London, 6:25369
Underground
Earth, energy, architecture and steel culvert construction, 6:25747
APPALACHIAN MOUNTAINS
Geologic Faults
A characterization of faults in the Appalachian foldbelt, 6:26416 (NUREG/CR—1621)
APPLIANCES
See also AIR CONDITIONERS
CLOTHES WASHERS
DEHUMIDIFIERS
DISHWASHERS
FREEZERS
HUMIDIFIERS
MICROWAVE OVENS
REFRIGERATORS
SPACE HEATERS
STOVES
WATER HEATERS
WOOD BURNING APPLIANCES
Energy Efficiency
Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980, 6:25720 (NBSIR—80-2145(DOE))
AQUACULTURE
Feasibility Studies
Pilot attempt to grow winter flounders commercially. Completion report 15 Feb 77-30 Jun 80, 6:26327 (PB—81-119273)
Waste Heat Utilization
Use of low-grade reject heat (Book chapter), 6:25618
AQUATIC ECOSYSTEMS
Acidification
Acidification: effects on freshwater fish, 6:26339 (CONF-800365—)
Aqueous speciation of aluminum in the Adirondack region of New York State, USA, 6:26250 (CONF-800365—)
Observed relationships between ionic composition of precipitation and runoff, 6:26261 (CONF-800365—)
Bibliographies
Publications of the Lawrence Lake ecosystem investigations, 6:26210 (DOE/EV/01599—T1(Pt.5))
Biological Models
Microcosmology: theoretical applications of biological models, 6:26213
Biological Stress
Ecologicall effects of experimental acidification on a stream ecosystem, 6:26387 (CONF-800365—)
Carbon Cycle
Inorganic carbon limitation during ecological succession in aquatic microcosms, 6:26227
Chemical Reactions
Some cautions in applying results from aquatic microcosms, 6:26218
Contamination
Stream microcosm for environmental assessment of pesticides, 6:26395
Disturbances
Microcosm approach to the study of biogeochemical systems. 2. Responses of aquatic laboratory microcosms to physical, chemical and biological perturbations, 6:26220
Dynamic Function Studies
Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238
Ecological Succession
Succession in laboratory microecosystems subjected to thermal and nutrient-addition stresses, 6:26235
Mathematical Models
Oxygen uptake and production in sediment-water microcosms, 6:26223
Microcosms
Fate and behavior of pesticides in a compartmentalized microcosm, 6:26193
Laboratory aquatic microcosms, 6:26229
Marine microcosms in ecological research, 6:26240
Microcosm approach to the study of biogeochemical systems. 2. Responses of aquatic laboratory microcosms to physical, chemical and biological perturbations, 6:26220
Microcosms in ecological research, 6:26212
Types of aquatic microcosms and their research applications, 6:26222
Use of microcosms to evaluate acid lake recovery techniques, 6:26236
Mineral Cycling
Dissolved organic matter and lake metabolism: biogeochemistry and controls of nutrient flux dynamics in lakes. Technical progress report, 1 July 1980-1 June 1981, 6:26207 (DOE/EV/01599—T1(Pt.1))
Littoral-pelagial interactions: the role of dissolved humic materials, 6:26209 (DOE/EV/01599—T1(Pt.4))
Predator-Prey Interactions
Does the change of predator system contribute to the biotic development in acidified lakes, 6:26371 (CONF-800365—)
Radionuclide Migration
Relative mobilization of zinc, cerium, and americium from sediment in an aquatic microcosm, 6:26293

Simulation
Applying results derived from experimental microcosms to the study of natural pelagic marine ecosystems, 6:26241
Evaluation of toxicant effects on structure and function of model stream communities: correlations with natural stream effects, 6:26394
Microcosms, macrophytes, and hierarchies: environmental research in the Chesapeake Bay, 6:26247
On-site flume studies for assessment of effluent impacts on stream aufwuchs communities, 6:26237
Semitropical marine microcosms: facility design and an elevated-nutrient-effects experiment, 6:26246
Synthesizing aquatic microcosms, 6:26215
Species Diversity
Potential for acid precipitation damage to aquatic ecosystems of the Sierra Nevada, California (USA), 6:26281 (CONF-800365—)
Thermal Pollution
Effects of temperature on periphyton biomass and community composition in the Browns Ferry experimental channels, 6:26328
Effects of elevated temperatures on macroinvertebrate populations in the Browns Ferry experimental ecosystems, 6:26329
Effects of temperature on bluegill reproduction and young-of-the-year standing stocks in experimental ecosystems, 6:26330
Turbulence
Turbulent mixing in aquatic microcosms, 6:26244
Water Chemistry
Effect of acid pH on sodium and chloride balance in an inhabitant of acid freshwaters: the waterbug Corixa punctata (Illig.) (Insecta, Hemiptera), 6:26382 (CONF-800365—)

AQUATIC ORGANISMS
(Unspecified biota characteristic of aquatic ecosystems.)
See also AUFWUCHS
BENTHOS
CRUSTACEANS
FISHES
MOLLUSCS
PLANKTON
WATER HYACINTHS
Bibliographies
Ecological investigations at power plant cooling lakes, reservoirs, and ponds: an annotated bibliography. Final report, 6:26324 (EPRI-EA—1874)
Entrainment
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)
Impingement
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)
Metabolism
Response of a benthic marine microcosm subjected to changes in energy flow, 6:26243
Mortality
Responses of aquatic microcosms to acute mortality, 6:26234
Population Dynamics
Applying results derived from experimental microcosms to the study of natural pelagic marine ecosystems, 6:26241
Experimental acidification of a whole lake: a test of the oligotrophication hypothesis, 6:26206 (CONF-800365—)
Some patterns in post-closure ecosystem dynamics (failure), 6:26225
Sensitivity
Acidification impacts on lakes in the Sudbury, Ontario, Canada area, 6:26358 (CONF-800365—)
Aqueous speciation of aluminum in the Adirondack region of New York State, USA, 6:26250 (CONF-800365—)
Effect of calcium on the toxicity of zinc and lead compounds in the water medium, 6:26362 (CONF-800365—)
Potential for acid precipitation damage to aquatic ecosystems of the Sierra Nevada, California (USA), 6:26281 (CONF-800365—)
Species Diversity
Ecology of acid streams draining forested and non-forested catchments in Scotland, 6:26280 (CONF-800365—)

AQUIFERS
Pumping
Analysis of pumping tests performed in a horizontal rectangular fracture, 6:26413 (LBL—12076)
Radionuclide Migration
Optimum model to predict radionuclide transport in an aquifer for the application to health effects evaluations, 6:25111 (CONF-801217—)
Tide
Aquifer response to earth tides, 6:26414 (LBL—12076)
ARAMIDS
Deformation
Structure-property relations of Kevlar 49 fibers, 6:25942 (UCRL—85744)
Failures
Structure-property relations of Kevlar 49 fibers, 6:25942 (UCRL—85744)
ARC COAL PROCESS
Environmental Impacts
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)
ARC FURNACES
Design
Nonconsumable arc melting furnace, 6:26024 (SAND—81-0810)
Fabrication
Nonconsumable arc melting furnace, 6:26024 (SAND—81-0810)
Performance
Nonconsumable arc melting furnace, 6:26024 (SAND—81-0810)
ARCHITECTURE
Evaluation
Absolutely constant incontestably stable architectural value scale, 6:25742
ARGON
Atom-Atom Collisions
Interaction potentials for Br(^{2}P)+Ar, Kr, and Xe (^{1}S) by the crossed molecular beams method, 6:26460
Laser Spectroscopy
Resonance ionization spectroscopy: counting noble-gas atoms, 6:26451 (CONF-8106100—1)
Photoionization
Electron spectra and structure of atomic and molecular clusters, 6:26450 (CONF-8004161—1)
Polarizability
Dielectric constant of atomic fluids with variable polarizability, 6:26471
ARGON 40 REACTIONS
Compound-Nucleus Reactions
Observation of giant dipole resonances built on states of high energy and spin, 6:26588
Fusion Reactions
Observation of giant dipole resonances built on states of high energy and spin, 6:26588
Inclusive Interactions
Correlations at small relative momenta among protons produced in collisions of 1.8 GeV/nucleon ^{40}Ar with a KCl target, 6:26488
ARGONNE NATIONAL LABORATORY
See ANL
ARIZONA
Wind Power
Techniques for assessing the wind energy resource in the Southern Rocky Mountain region, 6:25417 (PNL—3671)
ARKANSAS
Earth-Covered Buildings
Earth sheltered concrete domes using a geodesic formwork, 6:25748
ARMATURES
Design
Demonstration of a helical armature for a superconducting generator, 6:25481
AROMATICS
See also BENZENE
CONDENSED AROMATICS
PHENOLS

POLYCYCLIC AROMATIC HYDROCARBONS
TETRALIN
TOLUENE
XYLENES
Chemical Reactions
Coal structure cleavage mechanisms: scission of diphenylmethane and diphenyl ether linkages to hydroxylated rings, 6:24916
Exploratory study of reactivity in organic compounds subjected to shock loading (Diphenylhexadiyne), 6:25993 (SAND—81-1386C)
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877
ARSENIC ALLOYS
See ARSENIDES
ARSENIDES
Crystal Structure
Fluctuations and freezing in a one-dimensional liquid: Hg/sub 3-δ/AsF_6, 6:26617
ASCARIS
See NEMATODES
ASHES
See also FLY ASH
Catalytic Effects
Thermochemical gasification of woody biomass, 6:25186
Chemical Composition
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Flue gas conditioning experience at Tampa Electric Company, 6:25455 (EPRI-WS—80-127)
Lignite combustion test project summary report. Test L-115, 6:24957 (DOE/FC/02030—T1)
Electric Conductivity
Flue gas conditioning experience at Tampa Electric Company, 6:25455 (EPRI-WS—80-127)
Environmental Impacts
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Health Hazards
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Natural Radioactivity
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Sintering
Use of fuel additives in coal firing, 6:24960 (EPRI-WS—80-127)
Waste Disposal
Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion, 6:24949
Evaluation of potential impacts to the utility sector for compliance with RCRA, 6:25840 (EPA/600/9—81-019B)
Waste Product Utilization
Government procurement of cement and concrete containing fly ash, 6:24928 (EPA/600/9—81-019B)
ASPERGILLUS
Cell Cultures
/beta/-glucosidase production by aspergillus phoenicis in stirred-tank fermentors, 6:25288
Cultivation Techniques
/beta/-glucosidase production by aspergillus phoenicis in stirred-tank fermentors, 6:25288
ASPHALTENES
Liquid Column Chromatography
Coal classification by HPLC and three-dimensional detection, 6:24913
ASPHALTS
See also ASPHALTENES
Materials Testing
Asphalt emulsion sealing of uranium mill tailings. 1980 annual report, 6:25133 (PNL—3752)
ASTROCYTOMAS
See NEOPLASMS
ATMOSPHERIC PRECIPITATIONS
See also RAIN
SNOW
Chemical Composition
Analysis of atmospheric precipitation in Czechoslovakia, 6:26128 (CONF-800365—)
Comparative composition of continential and Nova Scotian precipitation, 6:26129 (CONF-800365—)
Effects of a Scots pine (Pinus sylvestris L.) canopy on the chemical composition and deposition pattern of precipitation, 6:26138 (CONF-800365—)
Impact of land-use on the chemical composition of rain and snow in northern Minnesota, 6:26182 (CONF-800365—)
Meteorological interpretation of the chemical composition of precipitation and some results of sequential rain sampling, 6:26135 (CONF-800365—)
Ionic Composition
Observed relationships between ionic composition of precipitation and runoff, 6:26261 (CONF-800365—)
PH Value
pH and sulphate content of precipitation over Northern Britain, 6:26136 (CONF-800365—)
Sulfates
pH and sulphate content of precipitation over Northern Britain, 6:26136 (CONF-800365—)
ATOMIC BOMBS
See NUCLEAR WEAPONS
ATOMIC EXPLOSIONS
See NUCLEAR EXPLOSIONS
ATOMIC MODELS
Self-Consistent Field
Quadratically convergent MCSCF theory for large-configuration sets, 6:26448 (CONF-800726—2)
ATOMIC SHELLS
See ELECTRONIC STRUCTURE
ATOMIC WEAPONS
See NUCLEAR WEAPONS
ATOM-MOLECULE COLLISIONS
Energy-Level Transitions
Factorization relations and consistency conditions in the sudden approximation, 6:26461
Sudden Approximation
Factorization relations and consistency conditions in the sudden approximation, 6:26461
ATOMS
See also MUONIC ATOMS
Electronic Structure
Research with x rays, 6:26093
AUFWUCHS
Population Dynamics
Effects of temperature on periphyton biomass and community composition in the Browns Ferry experimental channels, 6:26328
Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238
On-site flume studies for assessment of effluent impacts on stream aufwuchs communities, 6:26237
Radionuclide Migration
Relative mobilization of zinc, cerium, and americium from sediment in an aquatic microcosm, 6:26293
AURORAL ZONES
Electron Precipitation
Near-equatorial, high-resolution measurements of electron precipitation at L≅6.6, 6:26443
AUSTENITIC STEELS
Standards
Steel plates for nuclear and other special applications (ASME SA-647 with additional requirements), 6:25498 (NE-M—5-23T(4/81)(Rev.))
AUSTRALIA
Arid Lands
Lithotecture of Australia: with specific reference to thermal factors, 6:25734
Earth-Covered Buildings
Lithotecture of Australia: with specific reference to thermal factors, 6:25734
Lithotecture of Australia: with specific reference to user health factors, 6:25735
AUTOMOBILES
See also TAXICABS

Air Pollution Control
Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4))
Automotive Fuels
Composition and octane number of US motor gasolines sampled in the Du Pont 1979 summer road octane survey, 6:25891 (DOE/BETC/IC—80/3(Vol.4))
Gasohol: laboratory and fleet test evaluation, 6:25885 (DOE/BETC/IC—80/3(Vol.4))
Certification
Support for the analytical tools for automotive fuel economy activities. Final report 30 Nov 77-1 Jul 80, 6:25867 (PB—81-109555)
Diesel Engines
Emissions characteristics of light-duty diesel vehicles, 6:25859 (DOE/BETC/IC—80/3(Vol.4))
Energy Storage Systems
Future possibilities for energy-storage automobiles, 6:25881 (UCRL—85902)
Exhaust Gases
Baseline fuel economy and emissions tests of a Chrysler 1978, 225 CID engine. Final report, 6:25866 (PB—81-105819)
Gasohol: laboratory and fleet test evaluation, 6:25885 (DOE/BETC/IC—80/3(Vol.4))
Maximizing efficiency of fuel production and utilization, 6:25856 (DOE/BETC/IC—80/3(Vol.4))
Technical feasibility of the proposed 1982-1983 high altitude standards for light duty vehicles and light duty trucks. Technical report, 6:25873 (PB—81-118630)
Testing support for evaluation of inspection/maintenance issues. (Test Group No. 1). Technical report, 6:25870 (PB—81-115081)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 2 and 5). Technical report, 6:25871 (PB—81-115099)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 3, 4 and 7). Technical report, 6:25872 (PB—81-115107)
The effects on measured emissions of a modified FTP (Federal Test Procedure) driving cycle. Technical report, 6:25884 (PB—81-103350)
Federal Test Procedure
The effects on measured emissions of a modified FTP (Federal Test Procedure) driving cycle. Technical report, 6:25884 (PB—81-103350)
Fuel Economy
Baseline fuel economy and emissions tests of a Chrysler 1978, 225 CID engine. Final report, 6:25866 (PB—81-105819)
Gasohol: laboratory and fleet test evaluation, 6:25885 (DOE/BETC/IC—80/3(Vol.4))
Highway fuel economy of gasohol and unleaded gasoline, 6:25894
Impact of fuel-economy information on new-car and light-truck buyers, 6:25754 (DOE/CS/58840—T1)
Support for the analytical tools for automotive fuel economy activities. Final report 30 Nov 77-1 Jul 80, 6:25867 (PB—81-109555)
Gas Turbine Engines
Overview: DOE/NASA automotive gas turbine and Stirling projects, 6:25865 (DOE/NASA/51040—28)
Support services for the automotive-gas-turbine project, 6:25863 (DOE/NASA/0144—81/1)
Inspection
Testing support for evaluation of inspection/maintenance issues. (Test Group No. 1). Technical report, 6:25870 (PB—81-115081)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 2 and 5). Technical report, 6:25871 (PB—81-115099)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 3, 4 and 7). Technical report, 6:25872 (PB—81-115107)
Internal Combustion Engines
Automotive fuel economy: potential improvement through selected engine lubricants, 6:25858 (DOE/BETC/IC—80/3(Vol.4))
Evaporative emissions from vehicles operating on methanol/gasoline blends, 6:25889 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4))
Fleet trials using methanol/gasoline blends, 6:25890 (DOE/BETC/IC—80/3(Vol.4))
Lubricating Oils
Automotive fuel economy: potential improvement through selected engine lubricants, 6:25858 (DOE/BETC/IC—80/3(Vol.4))
Maintenance
Testing support for evaluation of inspection/maintenance issues. (Test Group No. 1). Technical report, 6:25870 (PB—81-115081)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 2 and 5). Technical report, 6:25871 (PB—81-115099)
Testing support for evaluation of inspection/maintenance issues (Test Group Nos. 3, 4 and 7). Technical report, 6:25872 (PB—81-115107)
Spark Ignition Engines
Automotive fuel economy: potential improvement through selected differential gear lubricants, 6:25857 (DOE/BETC/IC—80/3(Vol.4))
Maximizing efficiency of fuel production and utilization, 6:25856 (DOE/BETC/IC—80/3(Vol.4))
Stirling Engines
Overview: DOE/NASA automotive gas turbine and Stirling projects, 6:25865 (DOE/NASA/51040—28)
System safety in Stirling engine development, 6:25876 (DOE/NASA/51040—25)
Stratified Charge Engines
Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4))
Surface Coating
Automobile and light-duty truck surface coating operations-background information for promulgated standards. Final report, 6:26156 (PB—81-113920)

AUTOMOTIVE FUELS
See also GASOLINE
Processing and utilization. Annual report, October 1, 1979-September 30, 1980, 6:25054 (DOE/BETC/IC—80/3(Vol.4))
Antiknock Ratings
Maximizing efficiency of fuel production and utilization, 6:25856 (DOE/BETC/IC—80/3(Vol.4))
Data Compilation
Alternative fuels data bank, 6:25888 (DOE/BETC/IC—80/3(Vol.4))
Information Centers
Alternative fuels data bank, 6:25888 (DOE/BETC/IC—80/3(Vol.4))
Methane
Performance of a CFR engine burning simulated anaerobic digester's gas, 6:25893
Performance Testing
Fleet experience using three blends of ethanol and unleaded gasoline, 6:25197
Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4))
Performance of a CFR engine burning simulated anaerobic digester's gas, 6:25893
Production
Feasibility study: utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamas County, Oregon, 6:25892 (DOE/RA/50366—T1)

AUTOMOTIVE INDUSTRY
Energy Conservation
Facts about industrial energy conservation in the United States, 6:25676 (CONF-7910214—)
Energy Efficiency
Good housekeeping at Vauxhall Motors Limited Luton, 6:25791 (CONF-7910214—)

Energy Management
Good housekeeping at Vauxhall Motors Limited Luton, 6:25791 (CONF-7910214—)

AUTORADIOGRAPHS
See IMAGES

AVIATION FUELS
See also JET ENGINE FUELS
Cost
Overview of aviation energy programs and supply problems, 6:25758

AZO DYES
Chemical Radiation Effects
Radiation stability of azo dyes in aqueous solutions (Gamma radiation), 6:26002 (DP-TR—19)
Reduction
Radiation stability of azo dyes in aqueous solutions (Gamma radiation), 6:26002 (DP-TR—19)

B

BACTERIA
Food Chains
Microbial trophic structure and habitable pore space in soil, 6:26180
Growth
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
Population Density
Littoral-pelagial interactions: the role of dissolved humic materials, 6:26209 (DOE/EV/01599—T1(Pt.4))
Population Dynamics
Effects of experimental acidification on soil organism populations and decomposition, 6:26348 (CONF-800365—)
Survival Time
Effects of moisture content on long-term survival and regrowth of bacteria in wastewater sludge, 6:26313
Response of bacteria in wastewater sludge to moisture loss by evaporation and effect of moisture content on bacterial inactivation by ionizing radiation (^{60}Co), 6:26321

BAG MODEL
Gauge Invariance
Quark confinement, 6:26537

BALLASTS
Energy Efficiency
Energy savings with solid-state ballasted high-pressure sodium lamps, 6:25841 (LBL—12595)
Performance
Energy savings with solid-state ballasted high-pressure sodium lamps, 6:25841 (LBL—12595)

BALLOONING INSTABILITY
Kinetic Equations
Kinetic effects on ballooning modes in mirror machines, 6:26655

BANKS
See COMMERCIAL BUILDINGS

BARIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)

BARSTOW SOLAR PILOT PLANT
Beam Monitoring
10-MWe Solar-Thermal Central-Receiver Pilot Plant: solar-facilities design integration. BCS hardware and software specification (RADL item 3-2), 6:25305 (SAN—0499-53)
Beam Optics
10-MWe Solar-thermal central-receiver pilot plant: solar-facilities design integration. Beam-characterization subsystem targets procurement documentation (RADL item 7-43), 6:25300 (DOE/SF/10499—T31)
Control Equipment
Plant-control-room design specification (RADL item 7-26): 10-MWe solar-thermal central-receiver pilot plant: solar-facilities design integration, 6:25302 (DOE/SF/10499—T34)
Design
Heat and mass balance design analysis (RADL Item 2-15), 6:25301 (DOE/SF/10499—T33)
Plant-control-room design specification (RADL item 7-26): 10-MWe solar-thermal central-receiver pilot plant: solar-facilities design integration, 6:25302 (DOE/SF/10499—T34)
Diagrams
Heat and mass balance design analysis (RADL Item 2-15), 6:25301 (DOE/SF/10499—T33)
Failure Mode Analysis
Failure modes and effects analysis (RADL Item 2-23), 6:25299 (DOE/SF/10499—T30)
Insolation
Measurements of typical insolation variation at Daggett, California. Volume II. Appendices including data sets, 6:25225 (ATR—80(7747)-1(Vol.2))
Measurements of typical insolation variation at Daggett, California. Volume I. Methodology and sample data, 6:25224 (ATR—80(7747)-1(Vol.1))
Specifications
10-MWe Solar-thermal central-receiver pilot plant: solar-facilities design integration. Beam-characterization subsystem targets procurement documentation (RADL item 7-43), 6:25300 (DOE/SF/10499—T31)
Start-Up
Pilot-plant startup and acceptance-test plan (RADL Item 2-46). 10-MWe solar-thermal central-receiver pilot plant. Solar-facilities design integration, 6:25304 (MDC-G—9330)
Testing
Pilot-plant startup and acceptance-test plan (RADL Item 2-46). 10-MWe solar-thermal central-receiver pilot plant. Solar-facilities design integration, 6:25304 (MDC-G—9330)
Thermal Energy Storage Equipment
Thermal-storage-subsystem analysis report (RADL Item 5-1), 6:25298 (DOE/SF/10499—T29)

BARTLESVILLE ENERGY TECHNOLOGY CENTER
Information Systems
Development of an automated project tracking system for the Bartlesville Energy Technology Center, 6:26716 (DOE/BETC/IC—80/3(Vol.4))
Research Programs
Development of an operational framework for the Liquid Fossil Fuel Cycle (LFFC), 6:26717 (DOE/BETC/IC—80/3(Vol.4))
Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980, 6:25000 (DOE/BETC/IC—80/3(Vol.2))
Processing and utilization. Annual report, October 1, 1979-September 30, 1980, 6:25054 (DOE/BETC/IC—80/3(Vol.4))
Resource assessment. Annual report, October 1, 1979-September 30, 1980, 6:24975 (DOE/BETC/IC—80/3(Vol.1))

BARYON NUMBER 2 RESONANCES
See DIBARYON RESONANCES

BARYONS
See also HYPERONS
NUCLEONS
Decay
Coldest neutron star, 6:26434
Pair Production
Search for narrow BB (π) states in 16 GeV/c π^- p and 5 GeV/c p-barp interactions, 6:26494

BASALT
Site characterization plan basalt waste isolation project, 6:25136 (RHO-BWI-CD—51(Rev.2))
Activation Analysis
Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)
Geologic Structures
Relationships between internal structures and petrographic textures of basalt flows: example from a continental flood tholeiite province, 6:26429 (RHO-BWI-SA—67)

Mineralogy
Relationships between internal structures and petrographic textures of basalt flows: example from a continental flood tholeiite province, 6:26429 (RHO-BWI-SA—67)
Radionuclide Migration
Fracture flow modeling for low-level nuclear waste disposal, 6:25114 (CONF-801217—)
Parametric and sensitivity analysis of waste isolation in a basalt medium, 6:25135 (RHO-BWI-C—94)

BATTERIES (ELECTRIC)
See ELECTRIC BATTERIES

BAUXITE
Recycling
Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)

BEAM STRIPPERS
Service Life
Carbon stripper foils for heavy-ion accelerators, 6:26069 (CONF-801111—46)

BEARINGS
Performance Testing
NTEV flywheel bearing integrity test, 6:25882 (DOE/CS/51213—T6)

BEES
See INSECTS

BENTHOS
Population Dynamics
Effects of acidification on the dynamics of allochthonous leaf material and benthic invertebrate communities in running waters, 6:26367 (CONF-800365—)
Semitropical marine microcosms: facility design and an elevated-nutrient-effects experiment, 6:26246
Trophic interactions in experimental marine ecosystems perturbed by oil, 6:26396
Species Diversity
Comparison of benthic invertebrates in lakes with different acidity, 6:26378 (CONF-800365—)

BENZENE
Hydrogenation
Applications of Fourier transform infrared spectroscopy to in situ catalyst surface studies, 6:25982 (SAND—80-2594C)

BENZENEDICARBONIC ACID-ORTHO
See PHTHALIC ACID

BENZOIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908

BERYLLIUM
Compression
Strain-rate effects in beryllium under shock compression, 6:25912 (SAND—80-2847C)
Crystal-Phase Transformations
Reshock and release behavior of beryllium, 6:25913 (SAND—80-2864C)
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Yield Strength
Reshock and release behavior of beryllium, 6:25913 (SAND—80-2864C)

BERYLLIUM 9 TARGET
Pion Reactions
Inclusive reactions of pions on nuclei, 6:26575

BERYLLIUM MODERATORS
See BERYLLIUM

BETA BACKSCATTERING GAGES
See RADIOMETRIC GAGES

BEVERAGE INDUSTRY
By-Products
Evaluation of potential food applications of dried distillers spent grain (DSG). Final research report, 6:25798 (DOE/CS/40352—T1)
Energy Demand
Stabilization and gasification of soft-drink manufacturing waste by conventional and two-phase anaerobic digestion, 6:25819
Energy Recovery
Alleviation of environmental problems of waste disposal with production of energy and carbon dioxide, 6:25820
Stabilization and gasification of soft-drink manufacturing waste by conventional and two-phase anaerobic digestion, 6:25819
Waste Management
Stabilization and gasification of soft-drink manufacturing waste by conventional and two-phase anaerobic digestion, 6:25819
Waste Product Utilization
Alleviation of environmental problems of waste disposal with production of energy and carbon dioxide, 6:25820

BICARBONATES
See ACID CARBONATES

BIOMASS
(All growing organic matter such as plants, trees, grasses, and algae.)
See also AGRICULTURAL WASTES
ALGAE
MAIZE
MANURES
PLANTS
SEAWEEDS
SUGAR BEETS
SUGAR CANE
TREES
WOOD
WOOD WASTES
Combustion
Thermochemical conversion of biomass to fuels and feedstocks: an overview of R & D activities funded by the Department of Energy, 6:25290
Energy Source Development
Biomass as a nonfossil fuel source, 6:25280
Industrial development of biomass energy sources, 6:25644
Gasification
Thermal conversion of solid wastes and biomass, 6:25183
Thermochemical conversion of biomass to fuels and feedstocks: an overview of R & D activities funded by the Department of Energy, 6:25290
Liquefaction
Thermal conversion of solid wastes and biomass, 6:25183
Thermochemical conversion of biomass to fuels and feedstocks: an overview of R & D activities funded by the Department of Energy, 6:25290
Meetings
Agri-energy roundtable, 6:25289
Agricultural energy. Volume 2. Biomass energy crop production, 6:25275
Biomass as a nonfossil fuel source, 6:25280
Plant Growth
Inorganic carbon limitation during ecological succession in aquatic microcosms, 6:26227
Pyrolysis
Thermal conversion of solid wastes and biomass, 6:25183
Research Programs
Thermochemical conversion of biomass to fuels and feedstocks: an overview of R & D activities funded by the Department of Energy, 6:25290

BIOMASS CONVERSION PLANTS
Air Pollution
Technology assessment of solar energy systems: air-quality effects of direct-solar and biomass systems in high- and low-deployment scenarios, 6:25229 (ANL/EES-TM—140)
Pilot Plants
Effects of reaction conditions on the aqueous thermochemical conversion of biomass to oil, 6:25284
US Department of Energy midwest appropriate technology small grants program. Semi-annual technical progress report, 6:25193 (DOE/R5/10217—1)

BIOMASS PLANTATIONS
Land biomass program. Annual report 1 Apr-31 Dec 79, 6:25254 (PB—81-113177)
Feasibility Studies
Forest biomass for energy: a perspective, 6:25281
Planning
Energy plantation and the photosynthesis energy factory, 6:25285

BIOTHERMOHOL PROCESS
Hybrid biothermal conversion of biomass to liquid fuels, 6:25194
BIOTITE
Annealing
Natural annealing of pleochroic haloes in biotite samples from deep drill holes, Fenton Hill, New Mexico, 6:26418
Temperature Measurement
Natural annealing of pleochroic haloes in biotite samples from deep drill holes, Fenton Hill, New Mexico, 6:26418
BIRDS
Ecology
Raptors of the Hanford Site and nearby areas of southcentral Washington, 6:26177 (PNL—3212)
BISMUTH 199
Isomeric Transitions
Decay of /sup 199m,g/Po: isomeric transitions in ^{199}Po and ^{199}Bi, 6:26592 (CONF-810649—6)
BISMUTH 209 TARGET
Pion Plus Reactions
Elastic pion double charge exchange reactions, 6:26578
BITTER SPAR
See DOLOMITE
BITUMENS
See also ASPHALTS
COAL TAR
Recovery
rf heating of Utah tar sands. Final report, October 1978-December 1979, 6:25083 (DOE/CH/90035—4)
Stability
Processing and stability characteristics of liquids from coal, shale, and heavy oils, 6:24900 (DOE/BETC/IC—80/3(Vol.4))
BITUMINOUS COAL
Carbonylation
Carbonylation studies with Illinois No. 6 bituminous coal, 6:24920
Chemical Composition
Economic and environmental tradeoffs in coal conversion, 6:25638 (CONF-800608—8)
Chemical Reactions
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 6:24875
Comparative Evaluations
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 6:24875
Desulfurization
Desulfurization of coal by oxidation in alkaline solutions, 6:24867 (IS-M—318)
Evaluation of the removal of organic sulfur from coal, 6:24866 (IS-M—317)
Dissolution
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 6:24875
Electron Microprobe Analysis
Evaluation of the removal of organic sulfur from coal, 6:24866 (IS-M—317)
Fuel Substitution
Economic and environmental tradeoffs in coal conversion, 6:25638 (CONF-800608—8)
Leaching
Desulfurization of coal by oxidation in alkaline solutions, 6:24867 (IS-M—318)
Oxidation
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
Pyrolysis
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)
Effects of calcium minerals on the rapid pyrolysis of a bituminous coal, 6:24879
Investigation of yields and characteristics of tars released during the thermal decomposition of coal, 6:24880
Structural Chemical Analysis
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
BLACK CHROME
Mechanical Properties
Microstructural and mechanical property evaluation of black-chrome coated solar collectors. II, 6:25385
Microstructure
Microstructural and mechanical property evaluation of black-chrome coated solar collectors. II, 6:25385
BLACK SHALES
Geochemical Surveys
Resource assessment of the eastern gas shales, 6:25067 (MLM—2831(OP))
Geology
Evaluation of Devonian shale potential in West Virginia, 6:25068 (DOE/MC/10389—T1)
BLANKETS (BREEDING)
See BREEDING BLANKETS
BLASTS
See EXPLOSIONS
BLOOD CELLS
Labelling
Investigations into agents for improving cell labeling with positron and gamma emitting radionuclides, 6:26306
BLOOD FLOW
Measuring Methods
In vivo quantitation of regional myocardial blood flow by positron-emission computed tomography (Dogs; ^{68}Ga; ^{141}Ce), 6:26309
N-13 ammonia as an indicator of myocardial blood flow (Dogs), 6:26310
BOGS
See SWAMPS
BOILER FUELS
Comparative Evaluations
Alternative-fuel price trajectories: preparation of MFBI size/usage overlays and new boiler order analysis. Subtask 3.3. Final report, 6:25800 (DOE/RG/10446—T2)
Fuel Additives
Overview of EPRI survey on fireside additives: excerpts from survey report, 6:24959 (EPRI-WS—80-127)
Fuel Substitution
Economic and environmental tradeoffs in coal conversion, 6:25638 (CONF-800608—8)
Residual Fuels
Use of fuel additives in oil firing, 6:25061 (EPRI-WS—80-127)
BOILERS
See also REFUSE-FUELED BOILERS
Capitalized Cost
Capital and operating costs for industrial boilers. Final report Apr-Jun 79, 6:26061 (PB—81-105934)
Cleaning
Cyclical warm boiler washing using furnace soot blowers in conjunction with additive usage, 6:25447 (EPRI-WS—80-127)
Use of fuel additives in coal firing, 6:24960 (EPRI-WS—80-127)
Corrosion
High-temperature corrosion and fouling in oil-fired power plants, 6:25062 (EPRI-WS—80-127)
Planning and executing fireside additive testing in Ontario Hydro, 6:24961 (EPRI-WS—80-127)
Retard back-end corrosion and acid emissions in oil-fired boilers, 6:25446 (EPRI-WS—80-127)
Summary of the discussion-group sessions on high-temperature corrosion and fouling in oil-fired boilers, 6:25064 (EPRI-WS—80-127)
Summary of discussion group sessions on back-end corrosion and acid emissions by oil-fired boilers, 6:25065 (EPRI-WS—80-127)
Use of fuel additives in oil firing, 6:25061 (EPRI-WS—80-127)
Design
Design study of the VTE boiler cycle for the desalination of sea water. Volume 1. Main report and Appendix A. Final report, 6:25449 (PB—81-113151)

Emission
Summary of discussion group sessions on back-end corrosion and acid emissions by oil-fired boilers, 6:25065 (EPRI-WS—80-127)
Flue Gas
CEGB experience with additive trials, 6:25063 (EPRI-WS—80-127)
Proceedings: symposium on flue-gas desulfurization, 6:24926 (EPA/600/9—81-019B)
Retard back-end corrosion and acid emissions in oil-fired boilers, 6:25446 (EPRI-WS—80-127)
Fouling
High-temperature corrosion and fouling in oil-fired power plants, 6:25062 (EPRI-WS—80-127)
Planning and executing fireside additive testing in Ontario Hydro, 6:24961 (EPRI-WS—80-127)
Summary of the discussion-group sessions on high-temperature corrosion and fouling in oil-fired boilers, 6:25064 (EPRI-WS—80-127)
Use of fuel additives in oil firing, 6:25061 (EPRI-WS—80-127)
Fuel Substitution
Alternative-fuel price trajectories: preparation of MFBI size/usage overlays and new boiler order analysis. Subtask 3.3. Final report, 6:25800 (DOE/RG/10446—T2)
Market
Alternative-fuel price trajectories: preparation of MFBI size/usage overlays and new boiler order analysis. Subtask 3.3. Final report, 6:25800 (DOE/RG/10446—T2)
Operating Cost
Capital and operating costs for industrial boilers. Final report Apr-Jun 79, 6:26061 (PB—81-105934)
Retrofitting
Direct firing of coal-water suspensions: state-of-the-art review, 6:24965

BOILING WATER REACTORS
See BWR TYPE REACTORS

BOLTS
See FASTENERS

BOLTZMANN-VLASOV EQUATION
Hamiltonian field description of the one-dimensional Poisson-Vlasov equations, 6:26640 (PPPL—1788)
Iterative Methods
Expeditions Vlasov solver for computation of ion extraction from a plasma, 6:26665

BONE MARROW
Transplants
Cytogenetic evidence for recurrence of acute myelogenous leukemia after allogeneic bone marrow transplantation in donor hematopoietic cells, 6:26312

BORON
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883

BORON 10
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)

BORON 10 REACTIONS
Compound-Nucleus Reactions
Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near N ~ 50, 6:26587

BORON 11
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)

BORON ALLOYS
Hyperfine Structure
Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}$P$_{16}$B$_6$Al$_3$ under extermal magnetic fields, 6:25897 (CONF-801134—16)

BORON FLUORIDES
Electronic Structure
Shape resonance effects in the photoabsorption spectra of BF_3, 6:26458
Photoelectron Spectroscopy
Shape resonance effects in the photoabsorption spectra of BF_3, 6:26458

BOROSILICATE GLASS
Leaching
Correlations between pH and glass leaching, 6:25134 (PNL-SA—9102)

BOROSILICATES
See BOROSILICATE GLASS

BOTTOMING CYCLES
Energy Conservation
Pipeline bottoming-cycle study: operational reliability and maintainability assessment, 6:25075 (GESP—813)
Feasibility Studies
Pipeline bottoming-cycle study: technological feasibility of the bottoming cycle. Task IIIC report, 6:25823 (GESP—785)

BOUNDARIES (GRAIN)
See GRAIN BOUNDARIES

BRAIN
Blood Flow
Effects of low power microwaves on the local cerebral blood flow of conscious rats, 6:26398 (AD—A-090426)

BRANCHIOPODS
Species Diversity
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. III. Cladoceran community structure and stratigraphy, 6:26273 (CONF-800365—)
Stratigraphy
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. III. Cladoceran community structure and stratigraphy, 6:26273 (CONF-800365—)

BREEDING BLANKETS
Design
Development of tritium breeding blankets for DT-burning fusion reactors, 6:26677 (CONF-801011—92)
First-wall, blanket, and shield engineering test program for magnetically confined fusion power reactors, 6:26684 (CONF-801011—100)
Eddy Currents
Electromagnetic effects involving a tokamak reactor first wall and blanket, 6:26676 (CONF-801011—91)
Materials Testing
Neutronic optimization of solid breeder blankets for STARFIRE design, 6:26682 (CONF-801011—98)
Neutron Transport
Analysis of the ORNL radiation-streaming integral experiments, 6:26629 (CONF-810606—40)
Tritium Recovery
Analysis of in-situ tritium recovery from solid fusion-reactor blankets, 6:26675 (CONF-801011—90)

BREMSSTRAHLUNG (MAGNETIC)
See SYNCHROTRON RADIATION

BRINES
Chemical Composition
Characterization of fossil liquids, 6:25056 (DOE/BETC/IC—80/3(Vol.4))
Corrosive Effects
Method for inhibiting silica precipitation and scaling in geothermal flow systems (Patent), 6:25398
Degassing
Multi-stage flash degaser (Patent), 6:25397
Dielectric Properties
Dielectric relaxation of oil-external microemulsions, 6:25994
Partition
Development of a rapid and accurate method for determining partition coefficients of chemical tracers between oils and brines (for single well tracer test), 6:24984 (DOE/BETC/IC—80/3(Vol.1))

Phase Studies
Dynamic interfacial properties and their effects on oil ganglia reconnection and displacement processes, 6:25024 (DOE/BETC/IC—80/3(Vol.2))
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))
Optimum surfactant systems for oil recovery, 6:25030 (DOE/BETC/IC—80/3(Vol.2))
Studies of aqueous solutions and microemulsions for enhanced oil recovery processes, 6:25053 (DOE/BETC/IC—80/3(Vol.2))
Scale Control
Method for inhibiting silica precipitation and scaling in geothermal flow systems (Patent), 6:25398
Solar Distillation
Use of solar concentrated brines for food processing, 6:25358

BROMIDES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977

BROMINE
Atom-Atom Collisions
Interaction potentials for $Br(^2P)+Ar$, Kr, and Xe (^1S) by the crossed molecular beams method, 6:26460
Chemical Reactions
Radiation chemical studies of nickel-glycine. Hydrogen abstraction by OH radicals and oxidation by Br_2^{-1} (Gamma radiation), 6:26003

BROMINE 75
High Spin States
High spin structure of ^{75}Br and the (N,Z) dependence of the nuclear deformation in the Br region, 6:26585

BROMINE 76
High Spin States
High-spin states and band structure in ^{76}Br, 6:26586

BUBBLES
Thermodynamics
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix B. Champagne effect. Final report, 6:25570 (EPRI-EM—1589(Vol.9)(App.B))

BUFFERS
Design
Surfactant synthesis, polymer buffer and surfactant slug design for the tertiary recovery of the Pennsylvania grade crude oil, 6:25021 (DOE/BETC/IC—80/3(Vol.2))

BUILDING MATERIALS
See also CEMENTS
CONCRETES
Heat Transfer
Influence of moisture and moisture gradients on heat transfer through porous building materials, 6:25752

BUILDINGS
See also ANIMAL SHELTERS
APARTMENT BUILDINGS
COMMERCIAL BUILDINGS
EARTH-COVERED BUILDINGS
FEDERAL BUILDINGS
GREENHOUSES
HOSPITALS
HOUSES
OFFICE BUILDINGS
PUBLIC BUILDINGS
RESIDENTIAL BUILDINGS
SCHOOL BUILDINGS
Energy Analysis
Comparison of load determination methodologies for building energy-analysis programs. Final report, 6:25717 (DOE/CE/20184—1)
Energy Audits
Practical energy auditing, 6:25714 (CONF-7910214—)
Energy Demand
Comparison of load determination methodologies for building energy-analysis programs. Final report, 6:25717 (DOE/CE/20184—1)
Energy Efficiency Standards
Building energy-performance-standards conference: Proceedings. Strategy paper number 12, 6:25691 (CONF-800277—)
Energy Management Systems
Energy management systems in buildings, 6:25712 (CONF-7910214—)
Solar Space Heating
Solar housing in Sweden, 6:25374
Solar housing in Denmark, 6:25375
Solar Water Heating
Solar housing in Denmark, 6:25375
Ventilation
Ventilation requirements for control of occupancy odor and tobacco smoke odor: laboratory studies. Final report, 6:26400 (LBL—12589)

BUNKER OILS
See RESIDUAL FUELS

BUNKERS
See HOPPERS

BUSES
Operation
Bus annunciator system, 6:25757 (Y—2244)

BUSINESS
Directories
Minority Network Directory: appendix B, 6:26302 (DOE/MI/01002—T5(App.B))

BUTANOIC ACID
See BUTYRIC ACID

BUTANOLS
Adsorption Heat
Thermodynamic properties of tertiary recovery systems, 6:25059 (DOE/BETC/IC—80/3(Vol.4))
Chemical Reactions
Oxidations of Illinois No. 6 coal at and below 60°C (Oxidizing agents are sodium hypochlorite, nitric acid and potassium butoxide), 6:24910
Phase Studies
Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980, 6:25033 (DOE/BETC/OR—19)

BUTYL ALCOHOLS
See BUTANOLS

BUTYRIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908

BUTYRIC ALCOHOLS
See BUTANOLS

BUYERS
See MARKETERS

BWR TYPE REACTORS
Containment
Evaluation of the simultaneous action of earthquake, LOCA and SRV on Mark-III containment and drywell structures (Safety Relief Valve), 6:25517 (BNL—29358)
Containment Systems
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Engineered Safety Systems
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Failure Mode Analysis
Methods of hazard analysis and nuclear safety engineering, 6:25542
Fault Tree Analysis
Methods of hazard analysis and nuclear safety engineering, 6:25542
Fuel Cycle
Resource consequences of reenrichment versus blending, 6:25500 (HEDL-SA—2322-FP)
Loss of Coolant
Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region, 6:25522 (CONF-810801—3(Summ.))
Reactor Accidents
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Reactor Materials
Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region, 6:25522 (CONF-810801—3(Summ.))

Reactor Protection Systems
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Reactor Safety
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Risk Assessment
Methods of hazard analysis and nuclear safety engineering, 6:25542
Spent Fuels
Resource consequences of reenrichment versus blending, 6:25500 (HEDL-SA—2322-FP)

C

CADMIUM
Biochemical Reaction Kinetics
Heavy-metal and nutrients effects on sediment oxygen demand in three-phase aquatic microcosms, 6:26224
Doppler Broadening
Temperature dependence of the Doppler-broadened positron annihilation spectra in single and polycrystalline Cd, 6:25925
Environmental Transport
Metal tracers in two marine microcosms: sensitivity to scale and configuration, 6:26290
CADMIUM SULFIDE SOLAR CELLS
Electrical Properties
Controlling influence of the Cu/sub 2/S optical absorption coefficient on the short-circuit currents of cu/sub 2/S/CdS solar cells, 6:25273
Mathematical Models
CdS/Cu_2S solar cell: basic operation and anomalous effects, 6:25286
Reviews
CdS/Cu_2S solar cell: basic operation and anomalous effects, 6:25286
CADMIUM SULFIDES
Crystal Defects
Shock-induced defects in cadmium sulfide, 6:25953 (SAND—81-1354C)
Heterojunctions
Low cost, sprayed CdTe solar cell research. Semiannual progress report, August 15-February 14, 1981, 6:25257 (SERI/PR—8104-3-T3)
Physical Properties
Controlling influence of the Cu/sub 2/S optical absorption coefficient on the short-circuit currents of cu/sub 2/S/CdS solar cells, 6:25273
Spray Coating
Low cost, sprayed CdTe solar cell research. Semiannual progress report, August 15-February 14, 1981, 6:25257 (SERI/PR—8104-3-T3)
CADMIUM TELLURIDE SOLAR CELLS
Electrical Properties
Controlled cadmium telluride thin films for solar-cell applications. Third quarterly report, December 1, 1980-February 1, 1981, 6:25260 (SERI/PR—9131-1-T3)
Low cost, sprayed CdTe solar cell research. Semiannual progress report, August 15-February 14, 1981, 6:25257 (SERI/PR—8104-3-T3)
Fabrication
Controlled cadmium telluride thin films for solar-cell applications. Third quarterly report, December 1, 1980-February 1, 1981, 6:25260 (SERI/PR—9131-1-T3)
Low cost, sprayed CdTe solar cell research. Semiannual progress report, August 15-February 14, 1981, 6:25257 (SERI/PR—8104-3-T3)
CADMIUM TELLURIDES
Emission Spectra
Radiation-to-light converters for nuclear environments: near-infrared emitters, 6:26083 (UCRL—85604)
Heterojunctions
Low cost, sprayed CdTe solar cell research. Semiannual progress report, August 15-February 14, 1981, 6:25257 (SERI/PR—8104-3-T3)
Spray Coating
Low cost, sprayed CdTe solar cell research. Semiannual progress report, August 15-February 14, 1981, 6:25257 (SERI/PR—8104-3-T3)
CAES
See COMPRESSED AIR ENERGY STORAGE
CAES PLANT
See COMPRESSED AIR STORAGE POWER PLANTS
CALCINATION
Equipment
Design and performance of a full-scale spray calciner for nonradioactive high-level-waste-vitrification studies, 6:25132 (PNL—3742)
CALCIUM
Biological Effects
Effect of calcium on the toxicity of zinc and lead compounds in the water medium, 6:26362 (CONF-800365—)
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
CALCIUM 40
Energy Levels
Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca, 6:26579
CALCIUM 40 TARGET
Neutron Reactions
Calculation of neutron and gamma-ray production cross sections for calcium from 8 to 20 MeV, 6:26581 (ORNL/TM—7752)
Pion Minus Reactions
Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca, 6:26579
Pion Plus Reactions
Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca, 6:26579
CALCIUM 42 TARGET
Pion Plus Reactions
Elastic pion double charge exchange reactions, 6:26578
CALCIUM BROMIDES
Hyperfine Structure
Hyperfine and spin—rotational structure of CaBr X $^2\Sigma$ (v = 0) by molecular-beam laser-rf double resonance, 6:26456
Microwave Spectra
Hyperfine and spin—rotational structure of CaBr X $^2\Sigma$ (v = 0) by molecular-beam laser-rf double resonance, 6:26456
CALCIUM CARBONATES
Catalytic Effects
Thermochemical gasification of woody biomass, 6:25186
Deposition
River Hoegvadsan liming project: a presentation, 6:26365 (CONF-800365—)
Environmental Effects
Effects of acid precipitation on soil and forest. 7. Soil animals, 6:26354 (CONF-800365—)
CALCIUM OXIDES
Catalytic Effects
Thermochemical gasification of woody biomass, 6:25186
Hydration
Hydration of spent limestone and dolomite to enhance sulfation in fluidized-bed combustion, 6:24956 (CONF-800806—45)
CALIFORNIA
Acid Rain
Acid precipitation and ecological effects in Northern California, 6:26127 (CONF-800365—)

Energy Models
Energy modeling. Volume II. Inventory and details of state energy models (Book), 6:25592 (DOE/CS/10046—2(Vol.2))
Insolation
Measurements of typical insolation variation at Daggett, California. Volume II. Appendices including data sets, 6:25225 (ATR—80(7747)-1(Vol.2))
Measurements of typical insolation variation at Daggett, California. Volume I. Methodology and sample data, 6:25224 (ATR—80(7747)-1(Vol.1))
Regional Analysis
Acid precipitation and ecological effects in Northern California, 6:26127 (CONF-800365—)
Residential Buildings
Overview of the Committee-proposed residential building standards, 6:25731
Ships
Inventory of emissions from boating sources in California. Final report, 6:26152 (PB—81-111460)
Water Resources
Small hydroelectric potential at existing hydraulic structures in California. Bulletin 211, 6:25208 (DOE/R9/10019—T2)
Small hydroelectric potential at existing hydraulic structures in California. Appendixes: data and guidelines for development. Bulletin 211, 6:25207 (DOE/R9/10019—T1)
Wind Power
Techniques for assessing the wind energy resource in the Southwest region, 6:25418 (PNL—3672)

CALIFORNIUM 249 TARGET
Neutron Reactions
Yields of fission products produced by thermal-neutron fission of ^{249}Cf, 6:26600

CALIFORNIUM IONS
Ion-Ion Collisions
Theory of positron production in heavy-ion collisions, 6:26466

CAMAC SYSTEM
(Computer Application to Measurement And Control.)
Interfaces
Two Word CAMAC I/O module, 6:26082 (SLAC-TN—81-2)

CANCER
See NEOPLASMS

CANONICAL EQUATIONS
See DIFFERENTIAL EQUATIONS

CAPACITORS
Aging
Aging characteristics of the SA1773 ceramic capacitor, 6:26051 (SAND—80-1132)
Leakage Current
Aging characteristics of the SA1773 ceramic capacitor, 6:26051 (SAND—80-1132)
Performance
Aging characteristics of the SA1773 ceramic capacitor, 6:26051 (SAND—80-1132)

CAPILLARY FLOW
Mathematical Models
Analytical models for simultaneous heat and moisture transport in soils, 6:25140 (RHO-LD—49)

CARBAMIDE
See UREA

CARBANIONS
Photochemical Reactions
Electron photoejection in carbanions. Progress report, July 1, 1980-June 30, 1981, 6:25998 (DOE/ER/10424—1)

CARBON
See also ACTIVATED CARBON
GRAPHITE
Muon Reactions
Shadowing in muon-nucleus scattering, 6:26483
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
Photoacoustic Spectroscopy
Normalizing infrared FT photoacoustic spectra of solids, 6:25960
Photoemission
Photoemission measurements for low energy x-ray detector applications, 6:26609 (LA-UR—81-1712)

CARBON 11
Uptake
Synthesis and brain uptake of carbon-11 phenethylamine, 6:26008

CARBON 12
Energy Levels
Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca, 6:26579

CARBON 12 REACTIONS
Compound-Nucleus Reactions
High-spin states and band structure in ^{76}Br, 6:26586

CARBON 12 TARGET
Electron Reactions
Mesonic processes in deep-inelastic electron scattering from nuclei, 6:26607
Pion Minus Reactions
Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca, 6:26579
Pion Plus Reactions
Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca, 6:26579
Pion Reactions
Inclusive reactions of pions on nuclei, 6:26575

CARBON 13
Isotope Separation
Vibrational energy-transfer kinetics in molecular disequilibrium. Progress report, 6:25978 (DOE/ER/10458—2)

CARBON DIOXIDE
Air Pollution Control
Technologies for the recovery and disposal of carbon dioxide, 6:26112 (BNL—29526)
Auger Effect
Analysis of the Auger spectra of CO and CO_2 , 6:26459
Auger Electron Spectroscopy
Analysis of the Auger spectra of CO and CO_2 , 6:26459
Mass Transfer
Two-dimensional modeling of the oceans and CO_2 uptake, 6:26289 (UCRL—85673)
Recovery
Alleviation of environmental problems of waste disposal with production of energy and carbon dioxide, 6:25820
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))
Removal
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))

CARBON DIOXIDE INJECTION
Testing
Single CO_2 injection well minitest in a low-permeability eastern carbonate reservoir--a preliminary report, 6:25036

CARBON MONOXIDE
Adsorption
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)
Air Pollution Control
Emissions characteristics of light-duty diesel vehicles, 6:25859 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4))
Feasibility of operating medium-speed diesel engines with coal derived liquids, 6:25439 (DOE/BETC/IC—80/3(Vol.4))
Fleet trials using methanol/gasoline blends, 6:25890 (DOE/BETC/IC—80/3(Vol.4))
Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4))
Auger Effect
Analysis of the Auger spectra of CO and CO_2 , 6:26459
Auger Electron Spectroscopy
Analysis of the Auger spectra of CO and CO_2 , 6:26459
Chemisorption
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly

technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)

Ecological Concentration
Profile of air quality in Region V, 6:26171 (PB—81-116097)

Methanation
COthane, methane from waste CO. Final technical report, 6:25182 (DOE/CS/40177—T2)
Hydrogen-carbon monoxide reactions in low-rank coal liquefaction, 6:24878

Oxidation
Applications of Fourier transform infrared spectroscopy to in situ catalyst surface studies, 6:25982 (SAND—80-2594C)
Catalytic activity of shock-loaded TiO_2 powder, 6:25984 (SAND—81-1352C)

Vibrational States
Vibrational energy-transfer kinetics in molecular disequilibrium. Progress report, 6:25978 (DOE/ER/10458—2)

Waste Product Utilization
COthane, methane from waste CO. Final technical report, 6:25182 (DOE/CS/40177—T2)

CARBON STEELS

Standards
Steel plates for nuclear and other special applications (ASME SA-647 with additional requirements), 6:25498 (NE-M—5-23T(4/81)(Rev.))

CARBOXYLIC ACIDS
See also MELLITIC ACID

Chemical Reactions
Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909

Labelling
Myocardial uptake of sup(123m)Te-labeled long-chain fatty acids. Effects of heteroatom position and total chain length, 6:26311

Recovery
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))

Tissue Distribution
Myocardial uptake of sup(123m)Te-labeled long-chain fatty acids. Effects of heteroatom position and total chain length, 6:26311

CARIBOU
See DEER

CATALYSIS

Comparative Evaluations
Engineering economic analysis of biomethanation of pyrolysis gas, 6:25181 (DOE/CE/20098—1)

CATALYSTS

Absorption Spectroscopy
Applications of Fourier transform infrared spectroscopy to in situ catalyst surface studies, 6:25982 (SAND—80-2594C)

Chemical Analysis
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883

Chemical Composition
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)

Comparative Evaluations
Development of new catalysts for coal liquids refining. Sixth quarterly report, 1 April 1980-30 June 1980, 6:24864 (FE—2595-6)

H-Coal Process
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883

Specificity
Coal to gasoline via Mobil MTG technology, 6:24896
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)

Synthesis
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)

CAUSTIC FLOODING
Some useful concepts derived from petroleum component properties for improved waterflooding studies, 6:25027 (DOE/BETC/IC—80/3(Vol.2))

Field Tests
Alkaline waterflooding demonstration project Ranger Zone, Long Beach Unit, Wilmington Field, California, 6:25005 (DOE/BETC/IC—80/3(Vol.2))
Improved oil recovery by alkaline flooding in the Huntington Beach field, 6:25003 (DOE/BETC/IC—80/3(Vol.2))

Rock-Fluid Interactions
Enhanced recovery with mobility and reactive tension agents, 6:25022 (DOE/BETC/IC—80/3(Vol.2))

CAVITIES
See also ROCK CAVERNS

Electromagnetic Surveys
Detection of water-filled and air-filled underground cavities, 6:26420 (UCRL—53127)

Thermal Conductivity
Heat transfer versus pitch angle for nonventilated, triangular-sectioned, apex-upward air-filled space, 6:25751

CCD
See CHARGE-COUPLED DEVICES

CELL KILLING

Radioinduction
Response of bacteria in wastewater sludge to moisture loss by evaporation and effect of moisture content on bacterial inactivation by ionizing radiation (^{60}Co), 6:26321

CELLS (BACTERIAL)
See BACTERIA

CELLULASE

Biosynthesis
Enzymatic conversion of crop residue to glucose and alcohol, 6:25192 (DOE/R5/10131—2)

CELLULOSE

Density
Blown cellulose fiber thermal insulations. Part 1. Density of cellulose fiber thermal insulation in horizontal applications, 6:25680

Enzymatic Hydrolysis
/beta/-glucosidase production by aspergillus phoenicis in stirred-tank fermentors, 6:25288
Enzymatic conversion of crop residue to glucose and alcohol, 6:25192 (DOE/R5/10131—2)

R Factors
Blown cellulose fiber thermal insulations. Part 2. Thermal resistance, 6:25681

Saccharification
/beta/-glucosidase production by aspergillus phoenicis in stirred-tank fermentors, 6:25288

Thermal Conductivity
Blown cellulose fiber thermal insulations. Part 2. Thermal resistance, 6:25681

CEMENT INDUSTRY

Heat Storage
Industrial thermal-storage applications, 6:25765 (CONF-800272—)

Waste Product Utilization
Waste as a fuel, 6:25785 (CONF-7910214—)

CEMENTS
See also PORTLAND CEMENT

Mixing
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)

Quality Control
Government procurement of cement and concrete containing fly ash, 6:24928 (EPA/600/9—81-019B)

CENTRAL RECEIVERS

Circulating Systems
Central receiver steam systems for industrial process heat applications, 6:25347 (SAND—81-8223)

Heat Transfer Fluids
Central receiver steam systems for industrial process heat applications, 6:25347 (SAND—81-8223)
CERAMICS
Heat Transfer
Fibrous insulation heat-transfer model, 6:25689
Physical Properties
Fibrous insulation heat-transfer model, 6:25689
CEREALS
See also MAIZE
WHEAT
Drying
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)
Solid Wastes
Evaluation of potential food applications of dried distillers spent grain (DSG). Final research report, 6:25798 (DOE/CS/40352—T1)
CERIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
CERIUM 141
Positron Computed Tomography
In vivo quantitation of regional myocardial blood flow by positron-emission computed tomography (Dogs; ^{68}Ga; ^{141}Ce), 6:26309
CERIUM 144
Radioecological Concentration
Relative mobilization of zinc, cerium, and americium from sediment in an aquatic microcosm, 6:26293
CESIUM
Ion Collisions
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)
CESIUM 137
Biological Radiation Effects
Response of a forest ecotone to ionizing radiation. Progress report, October 15, 1980-October 14, 1981, 6:26315 (DOE/EV/02283—2)
CFFF
See MHD GENERATOR CFFF
CHALKS
See LIMESTONE
CHARGE-COUPLED DEVICES
Design
Specifications for the Linear Charge Coupled Device for use in transient recording, 6:26052 (UCID—19048)
CHARGED-PARTICLE ACTIVATION
See ACTIVATION ANALYSIS
CHARM PARTICLES
See also CHARMED MESON RESONANCES
Particle Production
Open and hidden charm muoproduction, 6:26500
CHARMED MESON RESONANCES
See also D RESONANCES
F-2030 RESONANCES
Semileptonic Decay
Role of non-spectator interactions in charm and bottom decays, 6:26539
CHARMONIUM
Production
Topics in the theory of heavy-quark systems, 6:26520 (LBL—12558)
CHARS
Nuclear Magnetic Resonance
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)
CHEMICAL EFFLUENTS
Acid Rain
Alberta oil sands environmental research program. An overview, 6:26132 (CONF-800365—)
Environmental Effects
Fallout, distribution and some effects of Zn, Cd, Pb, Cu and As in aquatic ecosystems near a base metal smelter on Canada's Precambrian Shield, 6:26366 (CONF-800365—)
CHEMICAL EXPLOSIVES
See also TATB
Compacting
Study for compacting the explosive LX-17, 6:26097 (MHSMP—81-28)
Density
Study for compacting the explosive LX-17, 6:26097 (MHSMP—81-28)
Detonations
Comparison of molecular-dynamics calculations with observed initiation phenomena, 6:26099 (UCRL—85187)
Stability
Computer program for storage and retrieval of thermal-stability data for explosives, 6:26098 (MHSMP—81-29)
Thermodynamic Properties
Computer program for storage and retrieval of thermal-stability data for explosives, 6:26098 (MHSMP—81-29)
CHEMICAL INDUSTRY
Energy Conservation
Air separation by the Moltox process. Interim final report, 6:25797 (DOE/CS/40287—T1)
Energy conservation in French industry and at Rhone-Poulenc, 6:25794 (CONF-7910214—)
Energy conservation in the petroleum and chemistry industry: ammonia process. Final report, August 19, 1976-May 15, 1978, 6:25198 (NP—1903403)
Motivation: its role in energy conservation, 6:25847 (CONF-7910214—)
Energy Efficiency
Thermoeconomics of energy systems. Progress report, June 1, 1980-May 30, 1981, 6:25799 (DOE/ER/10518—2)
Thermal Efficiency
Thermoeconomics of energy systems. Progress report, June 1, 1980-May 30, 1981, 6:25799 (DOE/ER/10518—2)
CHEMICAL LASERS
Exhaust Gases
Time dependent Navier-Stokes solution of a turbulent gas jet ejected from a rectangular orifice into a high-subsonic crossflow. Doctoral thesis, 6:26031 (AD—A-090343)
CHEMICAL PLANTS
Cogeneration
Industry/DOE diesel cogeneration demonstration program, 6:25767 (CONF-800272—)
CHEMICAL PREPARATION
Quality Control
CTBN variability study. Final report, 6:25944 (BDX—613-2565)
CHEMICAL REACTORS
Monitoring
Preliminary environmenal assessment of the University of Minnesota, Duluth Coal Gasifier, FY 1980, 6:26149 (ORNL/TM—7728)
CHEMICAL VAPOR DEPOSITION
Phase Diagrams
Sandia technology, Volume 5, No. 4, 6:26620 (SAND—81-1065)
CHLORATES
Electric Conductivity
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Thermodynamic Properties
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Viscosity
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
CHLORIDES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977

CHLORINATED AROMATIC HYDROCARBONS
Biological Effects
Report to the Congress on ocean pollution and offshore development, October 1977 through September 1978. Annual report No. 6, 6:26298 (PB—81-118333)

CHLORINE
Activation Analysis
Simultaneous determination of antimony and chlorine in synthetic rubbers by 14-MeV neutron-activation analysis, 6:25971 (SAND—81-0156C)
Biological Effects
Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238

CHLORINE COMPOUNDS
Chemical Reactions
Oxidations of Illinois No. 6 coal at and below 60°C (Oxidizing agents are sodium hypochlorite, nitric acid and potassium butoxide), 6:24910

CHLOROPLASTS
Mass Transfer
Photochemistry and enzymology of photosynthesis. Progress report, November 1, 1978-May 31, 1981, 6:26308 (DOE/ER/03326—101)

CHROMATES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977

CHROMIUM
Biochemical Reaction Kinetics
Heavy-metal and nutrients effects on sediment oxygen demand in three-phase aquatic microcosms, 6:26224
Biological Effects
Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Environmental Transport
Metal tracers in two marine microcosms: sensitivity to scale and configuration, 6:26290
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
Waste Processing
Enhancement of methane gas production using an industrial waste in anaerobic digestion, 6:25179 (CONF-801210—26)

CHROMIUM HYDRIDES
Nuclear Magnetic Resonance
Nuclear magnetic resonance studies of hydrogen in TiCrsub(1.8)Hsub(x), 6:25936

CHROMIUM STEELS
(Steels containing only chromium as alloying element; see also CHROMIUM-NICKEL STEELS.)
Tensile Properties
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)

CHROMIUM-MOLYBDENUM STEELS
Mechanical Properties
Progress in understanding the mechanical behavior of pressure-vessel materials at elevated temperatures, 6:25899 (CONF-810625—18)
Sorptive Properties
Sorption of iodine on low-chromium-alloy steel, 6:25484 (CONF-810606—52)

CHROMODYNAMICS
See QUANTUM CHROMODYNAMICS

CLAMS
See MOLLUSCS

CLAYS
Ion Exchange
Semi-automated method for determining cation exchange capacity of clays in sedimentary rocks, 6:24998 (DOE/BETC/IC—80/3(Vol.1))

CLEAN AIR ACT
Economic Impact
Impact of New Source Performance Standards on advanced industrial energy technology, 6:25604 (CONF-801210—25)

CLIMATES
Mathematical Models
Causes of CO_2-induced sensitivity in a zonal climate model, 6:26163 (UCRL—85754)

CLINCH RIVER BREEDER REACTOR
Relief Valves
Status of prototype rupture disc testing in the large leak test rig, 6:25492 (DOE/SF/70030—T18)
Steam Generators
Simulation of fluid thermal fluctuations in the CRBRP steam generator using model testing, 6:25490 (CONF-810804—4)

CLOTHES WASHERS
Energy Efficiency Standards
Background document for the advanced notice of proposed rulemaking for dishwashers, television sets, clothes washers, humidifiers and dehumidifiers. Topical report subtask 1.1: consumers products minimum energy efficiency standards program, 6:25726 (SAI—026-79-855-LJ)

CLOUDS
(Limited to clouds in the earth atmosphere; for interstellar clouds see COSMIC DUST or COSMIC GASES.)
Chemical Composition
Role of clouds in atmospheric transport of mercury and other pollutants: 1. The link between acid precipitation, poorly buffered waters, mercury and fish. 2. The role of cloud water in atmospheric transport, 6:26133 (CONF-800365—)

CO2 FLOODING
See CARBON DIOXIDE INJECTION

COAL
See also BITUMINOUS COAL
LIGNITE
SOLVENT-REFINED COAL
SUBBITUMINOUS COAL
Air Pollution
A statistical study of coal sulfur variability and related factors - documentation for the coal sulfur variability data base and analytical program. Final report, 6:24935 (PB—81-111593)
Ashes
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Chemical Analysis
A statistical study of coal sulfur variability and related factors. Final report, 6:24906 (PB—81-111585)
Chemical Composition
Flue gas conditioning experience at Tampa Electric Company, 6:25455 (EPRI-WS—80-127)
Relation between coal aromatic carbon concentration and proximate analysis fixed carbon, 6:24918
Chemical Reactions
Chemical studies of the Ames oxydesulfurization process, 6:24911
Novel method for controlled oxidation, 6:24908
Oxidations of Illinois No. 6 coal at and below 60°C (Oxidizing agents are sodium hypochlorite, nitric acid and potassium butoxide), 6:24910
Cleaning
Cost benefits associated with the use of physically cleaned coal. Final report May 78-Nov 79, 6:24952 (PB—81-113953)
Combustion
Applications of fireside additives to utility boilers: workshop proceedings, 6:24958 (EPRI-WS—80-127)
Direct firing of coal-water suspensions: state-of-the-art review, 6:24965
Effects of a volatile fireside manganese additive on coal-fired utility boiler operation, 6:24962 (EPRI-WS—80-127)
Planning and executing fireside additive testing in Ontario Hydro, 6:24961 (EPRI-WS—80-127)
Summary of discussion-group sessions on use of additives in coal-fired plants, 6:24963 (EPRI-WS—80-127)

Summary of special discussion group on acid plumes and fallout, 6:25458 (EPRI-WS—80-127)
Use of fuel additives in coal firing, 6:24960 (EPRI-WS—80-127)

Desulfurization
Chemical studies of the Ames oxydesulfurization process, 6:24911
Evaluation of chemical coal cleaning processes, 6:24954

Devolatilization
Advanced coal-gasification system for electric-power generation. Fourth quarterly progress report, July 1-September 30, 1980, 6:24850 (DOE/ET/14752—T5)
Coal-devolatilization information for reactor modeling: assessment of data and apparatus availability with recommendations for research. Final report (318 references), 6:24860 (EPRI-AP—1803)

Dielectric Properties
Analysis of dielectric heating and conductive cooling of pyrite in coal, 6:24948 (IS-M—311)

Electric Conductivity
Flue gas conditioning experience at Tampa Electric Company, 6:25455 (EPRI-WS—80-127)

Extrusion
Applications of polymer extrusion technology to coal processing, 6:24953

Filtration
Dynamic simulation of the coal froth flotation and filtration processes, 6:24947 (CONF-810607—10)

Flotation
Dynamic simulation of the coal froth flotation and filtration processes, 6:24947 (CONF-810607—10)

Fluidized-Bed Combustion
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
Hydration of spent limestone and dolomite to enhance sulfation in fluidized-bed combustion, 6:24956 (CONF-800806—45)
Methods of improving limestone utilization in FBC, 6:24955 (CONF-800806—44)

Fuel Additives
Effects of a volatile fireside manganese additive on coal-fired utility boiler operation, 6:24962 (EPRI-WS—80-127)
Planning and executing fireside additive testing in Ontario Hydro, 6:24961 (EPRI-WS—80-127)
Summary of discussion-group sessions on use of additives in coal-fired plants, 6:24963 (EPRI-WS—80-127)
Summary of special discussion group on acid plumes and fallout, 6:25458 (EPRI-WS—80-127)
Use of fuel additives in coal firing, 6:24960 (EPRI-WS—80-127)

Gas Chromatography
Chromatography of coal derived products: general papers, 6:24922

Health Hazards
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))

Hydraulic Transport
Issues associated with coal-slurry-pipeline development (Including brief description of 10 proposed slurry pipelines; also state water laws), 6:24945 (ANL/EES-TM—139)

Hydrogenation
Mechanochemical hydrogenation of coal (Patent), 6:24865

Infrared Spectra
Investigations of the changes of coal structure occurring during gasification. Progress report, 6:24904 (DOE/PC/30210—T1)
Relation between coal aromatic carbon concentration and proximate analysis fixed carbon, 6:24918

Liquid Column Chromatography
Chromatography of coal derived products: general papers, 6:24922

Maritime Transport
Development of a standardized US flag dry-bulk carrier (phase II). steam coal trade projections. Final report, 6:24950 (PB—81-109688)

Materials Handling
Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion, 6:24949

Meetings
Chromatography of coal derived products: general papers, 6:24922
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation (Forecasting), 6:24968
Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion, 6:24949
Oxidative degradation of coal; the role of hydrogen in coal chemistry, 6:24921

Mixing
Direct firing of coal-water suspensions: state-of-the-art review, 6:24965

Molecular Structure
Investigation of aqueous sodium dichromate oxidation for coal structural studies, 6:24919
Relation between coal aromatic carbon concentration and proximate analysis fixed carbon, 6:24918

Nuclear Magnetic Resonance
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)

Oxidation
Chemical studies of the Ames oxydesulfurization process, 6:24911
Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909
Investigation of aqueous sodium dichromate oxidation for coal structural studies, 6:24919
Novel method for controlled oxidation, 6:24908
Oxidations of Illinois No. 6 coal at and below 60°C (Oxidizing agents are sodium hypochlorite, nitric acid and potassium butoxide), 6:24910
Oxidative degradation of coal; the role of hydrogen in coal chemistry, 6:24921

Prices
Analysis of alternative-fuel price trajectories, 6:24969 (DOE/RG/10446—T1)

Production
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation (Forecasting), 6:24968

Pyrolysis
Rapid pyrolysis and hydropyrolysis of Canadian coals, 6:24884

Rail Transport
Financial aspects of coal transportation by rail. Final report Oct 78-Sep 79, 6:24951 (PB—81-110868)

Resource Assessment
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)

Resource Development
Energy analysis of the coal fuel cycle: community health and resource change in an Appalachian coal county, 6:24971 (CONF-810652—5)

Storage
Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion, 6:24949

Structural Chemical Analysis
Chemical studies of the Ames oxydesulfurization process, 6:24911
Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909
Investigations of the changes of coal structure occurring during gasification. Progress report, 6:24904 (DOE/PC/30210—T1)
Novel method for controlled oxidation, 6:24908
Oxidations of Illinois No. 6 coal at and below 60°C (Oxidizing agents are sodium hypochlorite, nitric acid and potassium butoxide), 6:24910

Sulfur
A statistical study of coal sulfur variability and related factors - documentation for the coal sulfur variability data base and analytical program. Final report, 6:24935 (PB—81-111593)

Sulfur Content
A statistical study of coal sulfur variability and related factors. Final report, 6:24906 (PB—81-111585)

Trade
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation (Forecasting), 6:24968
Transport
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation (Forecasting), 6:24968
COAL FINES
Drying
Transient modeling of froth flotation and vacuum filtration processes, 6:24946 (CONF-810607—8)
Flotation
Transient modeling of froth flotation and vacuum filtration processes, 6:24946 (CONF-810607—8)
COAL GASIFICATION
See also ARC COAL PROCESS
COGAS PROCESS
IN-SITU GASIFICATION
LURGI SLAGGING PROCESS
OCCIDENTAL FLASH PYROLYSIS PROCESS
U-GAS PROCESS
WESTINGHOUSE GASIFICATION PROCESS
Evaluation of coal conversion catalysts. Annual report, 6:24870 (PB—81-111387)
Method of generating electricity using an endothermic coal gasifier and MHD generator (Patent), 6:25654
Rapid-rate bituminous coal gasification. Annual report 1 Jan-31 Dec 79, 6:24872 (PB—81-114290)
Air Pollution Control
Chemically active fluid bed for SOX control. Volume I. process evaluation studies. Final report Jul 75-Oct 79, 6:24939 (PB—81-113946)
High-temperature high-pressure particulate removal in coal gasification. Final report 1 Sep 78-1 Jan 80, 6:24938 (PB—81-113664)
Bench-Scale Experiments
Alternate fuels manufactured from high temperature solar thermal systems. Technical annual progress report, April 1, 1980-March 31, 1981, 6:24852 (DOE/ET/21067—2)
Catalysts
Development of catalysts for coal conversion. Annual report for 1979, 6:24871 (PB—81-111395)
Economics
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)
Industrial Wastes
Chemical and biological characterization of leachates from coal solid wastes. Final report Sep 76-Jun 79, 6:24930 (PB—81-114043)
Pollutants from synthetic fuels production: environmental evaluation of coal gasification screening tests. Final report Aug 78-Jul 79, 6:24940 (PB—81-114308)
Mathematical Models
Coal-devolatilization information for reactor modeling: assessment of data and apparatus availability with recommendations for research. Final report, 6:24860 (EPRI-AP—1803)
Meetings
Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal, 6:24892
Pollution
Addendum to: 'environmental assessment: source test and evaluation report--Chapman low-Btu gasification'. Final report Mar 79-Sep 80, 6:24936 (PB—81-113003)
Pollutants from synthetic fuels production: environmental evaluation of coal gasification screening tests. Final report Aug 78-Jul 79, 6:24940 (PB—81-114308)
Solar Process Heat
Apparatus for solar coal gasification (Patent), 6:24889
Continuous two-stage solar-gasification system, 6:24841 (CONF-801104—16)
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)
Waste Water
Biological removal of organic constituents in high-Btu coal gasification wastewaters, 6:24924 (CONF-8006171—1)
Use of macroreticular resin for separation of coal conversion process wastewater, 6:24931
Water Pollution Control
Disposal of soluble salt waste from coal gasification, 6:24923 (AD—A-090419)
COAL GASIFICATION PLANTS
Air Pollution
Preliminary environmenal assessment of the University of Minnesota, Duluth Coal Gasifier, FY 1980, 6:26149 (ORNL/TM—7728)
By-Products
Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant, 6:24848 (DOE/ET/13060—T4)
Capital
Synfuels challenges and opportunities, 6:24970
Design
Demonstration plant engineering and design. Phase I: the pipeline gas demonstration plant. Volume 7. Plant Section 500 - shift/methanation, 6:24845 (DOE/ET/13060—T3(Vol.7))
Status of the COGAS process: ICGG coal gasification demonstration plant project, 6:24893
Environmental Impacts
Environmental impact assessment guidelines for new source coal gasification facilities. Interim report (final), 6:24941 (PB—81-114555)
Hoppers
W-K-M Dyna-Seal Ball Valve METC SOA Test Valve No. A-7, state-of-the-art lockhopper valve-testing and development project. Summary test report, 6:24854 (DOE/MC—159)
Monitoring
Preliminary environmenal assessment of the University of Minnesota, Duluth Coal Gasifier, FY 1980, 6:26149 (ORNL/TM—7728)
Oxygen
Load-change testing of a large commercial oxygen plant. Final report, 6:24862 (EPRI-NP—1824)
Site Selection
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation, 6:24968
Solar Process Heat
Alternate fuels manufactured from high temperature solar thermal systems. Technical annual progress report, April 1, 1980-March 31, 1981, 6:24852 (DOE/ET/21067—2)
Valves
Anchor/Darling Double-Disc Gate Valve, METC SOA Test Valve No. A-12 and Test Valve No. A-12R state-of-the-art Lockhopper Valve-Testing and Development Project. Summary test report, 6:24855 (DOE/MC—169)
Lock hopper valves for coal gasification. Final report, 6:24842 (DOE/ET/10669—T7)
Waste Water
Efficacy of activated sludge/powdered activated carbon for removal of organic constituents in wastewater from commercial-scale, high-Btu coal gasification plant, 6:24925 (CONF-8006171—2)
COAL INDUSTRY
Health Hazards
Energy analysis of the coal fuel cycle: community health and resource change in an Appalachian coal county, 6:24971 (CONF-810652—5)
Socio-Economic Factors
Energy analysis of the coal fuel cycle: community health and resource change in an Appalachian coal county, 6:24971 (CONF-810652—5)
COAL LIQUEFACTION
See also H-COAL PROCESS
OCCIDENTAL FLASH PYROLYSIS PROCESS
SRC-II PROCESS
Conversion of bituminous coal in CO/H_2O systems II-pH dependence, 6:24881
Solvent effects on the hydroliquefaction of Wyodak coal, 6:24891
Bench-Scale Experiments
Hydrogen-carbon monoxide reactions in low-rank coal liquefaction, 6:24878
Catalysts
Effects of catalysts on short contact time coal liquefaction, 6:24882

Chemistry
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)
Isotopic investigation of the chemistry of coal hydroliquefaction, 6:24876
Oxidative degradation of coal; the role of hydrogen in coal chemistry, 6:24921
Hydrogen Transfer
Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly progress report, September-November 1980, 6:24858 (DOE/PC/30080—T3)
Meetings
Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal, 6:24892
Solvents
Evaluation of the donor ability of coal liquefaction solvents, 6:24874
Separation and characterization of polycyclic aromatic hydrocarbons and alkylphenols in coal derived solvents, 6:24915
Waste Water
Use of macroreticular resin for separation of coal conversion process wastewater, 6:24931

COAL LIQUEFACTION PLANTS
Capital
H-Coal technology, progress toward commercialization, 6:24894
Synfuels challenges and opportunities, 6:24970
Design
H-Coal technology, progress toward commercialization, 6:24894
SRC-II demonstration program: a status report, 6:24895
Economics
H-Coal technology, progress toward commercialization, 6:24894
Financial Incentives
H-Coal technology, progress toward commercialization, 6:24894
Financing
H-Coal technology, progress toward commercialization, 6:24894
Site Selection
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation, 6:24968

COAL LIQUIDS
Catalytic Cracking
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)
Chemical Analysis
Coal classification by HPLC and three-dimensional detection, 6:24913
Development and application of analytical techniques to chemistry of donor solvent liquefaction. Quarterly progress report, April 1980-June 1980, 6:25968 (DOE/PC/30041—T2)
Chemical Composition
Characterization of fossil liquids, 6:25056 (DOE/BETC/IC—80/3(Vol.4))
Conversion of solvent-refined coal to liquid products in the presence of Lewis acids, 6:24887
Chromatography
Separation and characterization of lignite derived preasphaltenes by gel permeation chromatography and nuclear magnetic resonance spectrometry, 6:24914
Combustion Heat
Thermodynamic studies on coal conversion processes, 6:24899 (DOE/BETC/IC—80/3(Vol.4))
Combustion Products
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
Fractionation
Conversion of solvent refined lignite into premium liquid fuels. Quarterly report, January-March 1981, 6:24853 (DOE/FC/10121—T1)
Development and application of analytical techniques to chemistry of donor solvent liquefaction. Quarterly progress report, April 1980-June 1980, 6:25968 (DOE/PC/30041—T2)
Gas Chromatography
Chromatography of coal derived products: general papers, 6:24922
Conversion of solvent refined lignite into premium liquid fuels. Quarterly report, January-March 1981, 6:24853 (DOE/FC/10121—T1)
Hydrogenation
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)
Development of new catalysts for coal liquids refining. Sixth quarterly report, 1 April 1980-30 June 1980, 6:24864 (FE—2595-6)
Evaluation of a short-residence-time two-stage SRC process. Final report, 6:24861 (EPRI-AP—1827)
Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report for the period October-December 1980 and annual summary for 1980, 6:24863 (FE—2315-60)
Liquid Column Chromatography
Chromatography of coal derived products: general papers, 6:24922
Meetings
Chromatography of coal derived products: general papers, 6:24922
Monitoring
Lightpipe luminoscope for monitoring occupational skin contamination, 6:26094
Nuclear Magnetic Resonance
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)
Conversion of solvent refined lignite into premium liquid fuels. Quarterly report, January-March 1981, 6:24853 (DOE/FC/10121—T1)
Oxidation
HPLC and phase transfer catalysis in the analysis of oxidation products of lignite liquids and model compounds (Oxidizing agents: trifluoroperacetic acid, ruthenium tetraoxide, ceric ammonium nitrate, potassium permanganate), 6:24912
Production
Conversion of solvent-refined coal to liquid products in the presence of Lewis acids, 6:24887
Research Programs
Feasibility of operating medium-speed diesel engines with coal derived liquids, 6:25439 (DOE/BETC/IC—80/3(Vol.4))
Operation of medium-speed diesel engines on blends of middle distillate SRCII with No. 2D oil, 6:25861 (DOE/BETC/IC—80/3(Vol.4))
Solvent Properties
Thermodynamic studies on coal conversion processes, 6:24899 (DOE/BETC/IC—80/3(Vol.4))
Specific Heat
Thermodynamic studies on coal conversion processes, 6:24899 (DOE/BETC/IC—80/3(Vol.4))
Stability
Fundamental synthetic fuel stability study, 6:24901 (DOE/BETC/IC—80/3(Vol.4))
Processing and stability characteristics of liquids from coal, shale, and heavy oils, 6:24900 (DOE/BETC/IC—80/3(Vol.4))
Stability characteristics of hydrocarbon fuels from alternative sources, 6:24902 (DOE/BETC/IC—80/3(Vol.4))
Storage
Fundamental synthetic fuel stability study, 6:24901 (DOE/BETC/IC—80/3(Vol.4))
Structural Chemical Analysis
HPLC and phase transfer catalysis in the analysis of oxidation products of lignite liquids and model compounds (Oxidizing agents: trifluoroperacetic acid, ruthenium tetraoxide, ceric ammonium nitrate, potassium permanganate), 6:24912

COAL MINERS
Productivity
Sources of deep-coal-mine productivity change, 1962 to 1975, 6:25635
COAL MINING
See also SURFACE MINING
Environmental Effects
Environmental effects of western coal combustion. Part III. The water quality of Rosebud Creek, Montana. Final report, 6:24937 (PB—81-113615)
COAL PREPARATION
Computerized Simulation
Dynamic simulation of the coal froth flotation and filtration processes, 6:24947 (CONF-810607—10)
Economics
Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion, 6:24949
Feasibility Studies
Analysis of dielectric heating and conductive cooling of pyrite in coal, 6:24948 (IS-M—311)
Industrial Wastes
Chemical and biological characterization of leachates from coal solid wastes. Final report Sep 76-Jun 79, 6:24930 (PB—81-114043)
Mathematical Models
Transient modeling of froth flotation and vacuum filtration processes, 6:24946 (CONF-810607—8)
On-Line Control Systems
Dynamic simulation of the coal froth flotation and filtration processes, 6:24947 (CONF-810607—10)
COAL PRODUCING DISTRICTS
Energy Analysis
Energy analysis of the coal fuel cycle: community health and resource change in an Appalachian coal county, 6:24971 (CONF-810652—5)
COAL SEAMS
Degassing
Demonstration project for methane recovery from deep coal seams, 6:24944
Fractures
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
COAL TAR
Chemical Composition
Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant, 6:24848 (DOE/ET/13060—T4)
Recovery
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))
Yields
Investigation of yields and characteristics of tars released during the thermal decomposition of coal, 6:24880
COAL-DERIVED LIQUIDS
See COAL LIQUIDS
COAL-FIRED MHD GENERATORS
See also MHD GENERATOR CFFF
MHD GENERATOR ETF
Coal Gasification
Method of generating electricity using an endothermic coal gasifier and MHD generator (Patent), 6:25654
Combustors
Development and heat transfer analysis of direct coal-fired MHD combustors, 6:25650 (DOE/ET/10815—T4)
Efficiency
Liquid-metal MHD for solar and coal, 6:25646 (CONF-800617—8)
Feasibility Studies
Liquid-metal MHD for solar and coal: system and component status, 6:25648 (CONF-800806—42)
Heat Recovery
MHD Heat and Seed Recovery Technology Project. Eleventh quarterly report, July-September 1980, 6:25645 (ANL/MHD—80-19)
Materials Testing
MHD Heat and Seed Recovery Technology Project. Eleventh quarterly report, July-September 1980, 6:25645 (ANL/MHD—80-19)
Seed Recovery
MHD Heat and Seed Recovery Technology Project. Eleventh quarterly report, July-September 1980, 6:25645 (ANL/MHD—80-19)
COASTAL REGIONS
Wind Power
Planetary boundary-layer wind model evaluation at a mid-Atlantic coastal site, 6:25420 (DOE/ET/23007—80/1)
COBALT
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Environmental Transport
Metal tracers in two marine microcosms: sensitivity to scale and configuration, 6:26290
COGAS PROCESS
Demonstration Plants
Status of the COGAS process: ICGG coal gasification demonstration plant project, 6:24893
CO-GENERATION
See COGENERATION
COGENERATION
Demonstration Programs
Industry/DOE diesel cogeneration demonstration program, 6:25767 (CONF-800272—)
Economic Impact
Indirect benefits of cogeneration district heating, 6:25624
Economics
Energy, capacity, and economic effects of cogeneration interfaced with electric-utility systems, 6:25438 (CONF-801210—27)
Marketing Research
Impact of New Source Performance Standards on advanced industrial energy technology, 6:25604 (CONF-801210—25)
COLD STORAGE
Feasibility Studies
Longterm solar heat storage in an underground water cistern retrofitted with thermal insulation. Final technical report, May 15, 1979-March 31, 1981, 6:25380 (DOE/R5/10106—3)
COLD TRAPS
Design
Design criteria and candidate concept for high-performance cold trap, 6:25491 (DOE/SF/00893—T4)
COLLISIONLESS PLASMA
Wave Propagation
Ponderomotive effects in collisionless plasma: A Lie transform approach, 6:26647
COLLOIDS
See also EMULSIONS
GELS
Physical Properties
Micellar properties of oil and additives, 6:25057 (DOE/BETC/IC—80/3(Vol.4))
COLONIES
See POPULATIONS
COLOR MODEL
Supersymmetry
Sequential internal supersymmetry, 6:26562
COLORADO
Wind Power
Techniques for assessing the wind energy resource in the Southern Rocky Mountain region, 6:25417 (PNL—3671)
COLUMBIA RIVER BASIN
Geology
Review of water-well data from the unconfined aquifer in the eastern and southern parts of the Pasco Basin, 6:26417 (RHO-BWI-C—56)
COLUMBIUM
See NIOBIUM

COMBINED-CYCLE POWER PLANTS
See also MHD GENERATOR ETF
Exhaust Gases
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
Failure Mode Analysis
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Feasibility Studies
Exhaust-fired fluid-bed combined cycle for power generation: preliminary feasibility study. Final report, 6:25442 (EPRI-CS—1818)
Fluidized-Bed Combustors
Exhaust-fired fluid-bed combined cycle for power generation: preliminary feasibility study. Final report, 6:25442 (EPRI-CS—1818)
Fuel Substitution
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
Gas Turbines
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
Reliability
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
COMBUSTORS
Corrosion
Combustion-system processes leading to corrosive deposits, 6:26010 (DOE/NASA/2593—27)
Design
Development and heat transfer analysis of direct coal-fired MHD combustors, 6:25650 (DOE/ET/10815—T4)
Failure Mode Analysis
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Fuel Injection Systems
A three-dimensional model of spray evaporation in gas turbine combustors. Interim report, 6:25854 (AD—A-090337)
Fuel Substitution
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
Performance
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
Reliability
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Thermal Analysis
Development and heat transfer analysis of direct coal-fired MHD combustors, 6:25650 (DOE/ET/10815—T4)
COMMERCIAL BUILDINGS
Energy Management
Energy management in a commercial organization, 6:25713 (CONF-7910214—)
Solar Space Heating
Oakmead solar buildings, 6:25333 (DOE/CS/31521—T1)
Performance of passive-solar space-heating systems. Comparative report, 1979-1980 heating season, 6:25351 (SOLAR/0022—81/39)
Solar Water Heating
Oakmead solar buildings, 6:25333 (DOE/CS/31521—T1)
COMMERCIALIZATION
See also MARKET
TECHNOLOGY TRANSFER
Economic Analysis
Multimarket, multitechnology, multiattribute technological forecasting, 6:25611
COMMUNICATIONS
See also DATA TRANSMISSION
RADIO EQUIPMENT
Interference
Impact of Satellite Power Systems on the Ionosphere, 6:25294 (DOE/CH/10003—1)
COMMUNITIES
Energy Conservation
Block grant energy conservation, 6:25842 (PB—81-107575)
Energy Management
Good housekeeping, 6:25675 (CONF-7910214—)
Lighting Systems
Energy savings with solid-state ballasted high-pressure sodium lamps, 6:25841 (LBL—12595)
Waste Management
Resouce recovery option in solid-waste management: a review guide for public officials , 6:25839 (DOE/CS/20156—T1)
COMMUNITIES (ECOLOGICAL)
See ECOSYSTEMS
COMPOST
Uses
Compost from sludge and refuse: applications and quality requirements, 6:25836 (CONF-7909198—)
COMPOUNDS (ORGANIC)
See ORGANIC COMPOUNDS
COMPRESSED AIR ENERGY STORAGE
Economic Analysis
Compressed air energy storage technology program. Annual report for 1980, 6:25573 (PNL—3804)
Research Programs
Compressed air energy storage technology program. Annual report for 1980, 6:25573 (PNL—3804)
Rock Caverns
Water coning in porous media reservoirs for compressed air energy storage, 6:25572 (PNL—3470)
Site Surveys
In situ premeability measurements for an underground compressed air storage project, 6:26407 (LBL—12076)
COMPRESSED AIR STORAGE POWER PLANTS
Environmental Impacts
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 10. Environmental studies. Final report, 6:25576 (EPRI-EM—1589(Vol.10))
Geological Surveys
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 6. Site investigation: shallow drilling. Final report, 6:25568 (EPRI-EM—1589(Vol.6))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 7. Site investigation: deep drilling. Final report, 6:25569 (EPRI-EM—1589(Vol.7))
Hydraulics
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix B. Champagne effect. Final report, 6:25570 (EPRI-EM—1589(Vol.9)(App.B))
Licensing
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 13. CAUPH preliminary licensing documentation. Final report, 6:25213 (EPRI-EM—1589(Vol.13))
Power Systems
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix E. Electrical systems. Final report, 6:25571 (EPRI-EM—1589(Vol.9)(App.E))
Regulations
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 13. CAUPH preliminary licensing documentation. Final report, 6:25213 (EPRI-EM—1589(Vol.13))
Safety
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 10. Environmental studies. Final report, 6:25576 (EPRI-EM—1589(Vol.10))

Site Selection
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 6. Site investigation: shallow drilling. Final report, 6:25568 (EPRI-EM—1589(Vol.6))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 7. Site investigation: deep drilling. Final report, 6:25569 (EPRI-EM—1589(Vol.7))

COMPUTER CODES
A Codes
ADVCON APT postprocessor, 6:26016 (BDX—613-2635)
B Codes
Systems model for evaluating population dose from low-level waste activities (Code BURYIT), 6:25168 (CONF-801217—)
C Codes
Computer program CCC: user's manual, 6:26475 (LBL—10909)
Computer simulation of the transient response of a 4 cylinder Stirling engine with burner and air preheater in a vehicle (CNTLA, CNTLB, and WARM.FOR), 6:25875 (DOE/NASA/0226—1)
Preliminary evaluation of automated ICES selection methodology, cost, 6:25639 (CONF-800804—41)
Comparative Evaluations
Solar heating and cooling (SHAC) simulation programs: assessment and evaluation. Volume 2. Detailed findings. Final report, 6:25343 (EPRI-EM—1866(Vol.2))
D Codes
Programmer's manual for the DOEHPE (DOE Heat Pump Efficiency) program, 6:25807 (SAI—444-80-533-LJ)
G Codes
GRPAUT: a computer code for automated isotopic analysis of plutonium spectra, 6:26722 (MLM—2841(OP))
Using GIFTS on the Cray-1 for the large coil test facility test: stand design analysis, 6:26022 (ORNL/TM—7665)
I Codes
Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1, 6:25404 (SAND—80-7154/1)
Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description, 6:25405 (SAND—80-7154/2)
M Codes
MORSE-C: a CDC-7600 program designed to solve nuclear criticality problems by using the Monte-Carlo method, 6:26025 (UCID—18993)
Verification of partially saturated zone moisture migration: model and field facilities, 6:25113 (CONF-801217—)
Manuals
MORSE-C: a CDC-7600 program designed to solve nuclear criticality problems by using the Monte-Carlo method, 6:26025 (UCID—18993)
Plotting program for milestone schedules and status reports user's manual, 6:26725 (SAND—80-8053)
Programmer's manual for the DOEHPE (DOE Heat Pump Efficiency) program, 6:25807 (SAI—444-80-533-LJ)
Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1, 6:25404 (SAND—80-7154/1)
Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description, 6:25405 (SAND—80-7154/2)
P Codes
PTTOPT APT postprocessor, 6:26015 (BDX—613-2634)
Small hydro plant development program (PTMDL computer code), 6:25212 (DOE/ID/01570—T21Vol.3App.L)
R Codes
Theory and user manual for OTEC C. W. pipe programs ROTECF and SEGPIP, 6:25317 (DOE/NOAA/OTEC—35)
S Codes
Development of instrumental methods of analysis of sulfur compounds in coal-process streams: computer program manual for estimating concentrations of inorganic sulfur moieties from a thermodynamic data base. Quarterly technical progress report, January-March 1981 (SXPICKT3 and SXPICKG3), 6:24903 (DOE/ET/10482—T1)
Theory and user manual for OTEC C. W. pipe programs ROTECF and SEGPIP, 6:25317 (DOE/NOAA/OTEC—35)
Thermal hydraulic analysis of the FFTF core usng SUPERENERGY-2, 6:25510 (HEDL-SA—2194)
T Codes
TRAC methods and models (PWR), 6:25528 (LA-UR—81-1498)
Testing
Solar heating and cooling (SHAC) simulation programs: assessment and evaluation. Volume 2. Detailed findings. Final report, 6:25343 (EPRI-EM—1866(Vol.2))
U Codes
Verification of partially saturated zone moisture migration: model and field facilities, 6:25113 (CONF-801217—)
W Codes
Computer simulation of the transient response of a 4 cylinder Stirling engine with burner and air preheater in a vehicle (CNTLA, CNTLB, and WARM.FOR), 6:25875 (DOE/NASA/0226—1)

COMPUTER GRAPHICS
Aesthetics
Illustrator's view of more-effective technical communication through computer graphics, 6:26719 (LA-UR—80-3457)
Computer Codes
Simplified plotting package for the LSI-11 computer and Tektronix terminals, 6:26718 (GA-A—16148)
Programming
Metafile for efficient sequential and random display of graphics, 6:26720 (LA-UR—80-3642)

COMPUTER NETWORKS
Computer Output Devices
Satellite graphics output station, 6:26721 (LA-UR—80-3716)
Interfaces
Sandia Computing Network NOS link conceptual design, 6:26727 (SAND—81-0859)

COMPUTERIZED SIMULATION
Accuracy
Comparison of load determination methodologies for building energy-analysis programs. Final report, 6:25717 (DOE/CE/20184—1)

CONCRETES
Creep
Long-term creep of Hanford concrete at 250°F and 350°F. Final report, 6:25138 (RHO-C—50)
Heat Transfer
Influence of moisture and moisture gradients on heat transfer through porous building materials, 6:25752
Procurement
Government procurement of cement and concrete containing fly ash, 6:24928 (EPA/600/9—81-019B)
Quality Control
Government procurement of cement and concrete containing fly ash, 6:24928 (EPA/600/9—81-019B)

CONDENSED AROMATICS
See also ANTHRACENE
NAPHTHALENE
PYRENE
Chemical Reactions
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877
Comparative Evaluations
Evaluation of the donor ability of coal liquefaction solvents, 6:24874
Thermodynamic Properties
Thermodynamic characterization of condensed-ring compounds, 6:25990 (DOE/BETC/IC—80/3(Vol.4))

CONDENSERS
Heat Transfer
Ammonia condensation experiments at Oak Ridge National Laboratory, 6:25313 (CONF-810622—1)

CONFIGURATION INTERACTION
Self-Consistent Field
Quadratically convergent MCSCF theory for large-configuration sets, 6:26448 (CONF-800726—2)

CONIFERS
See also PINES
Biological Stress
Air pollutants as additional stress factors of conifers under northern conditions (Finland), 6:26345 (CONF-800365—)
Nutrients
Effects of acid precipitation on soil and forest. 8. Foliar nutrient concentrations in field experiments, 6:26355 (CONF-800365—)
Plant Growth
Effect of acid precipitation on tree growth, 6:26338 (CONF-800365—)
Effects of acid precipitation on soil and forest. 10. The effect of growth of Norway spruce on soil acidity by acid irrigation, 6:26357 (CONF-800365—)
CONNECTICUT
Wind Power
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)
CONSERVATION (ENERGY)
See ENERGY CONSERVATION
CONTACTORS
See SWITCHES
CONTAINMENT SHELLS
Impact Tests
Results of full-scale turbine missile concrete impact experiments, 6:25538 (SAND—81-0353C)
Missile Protection
Results of full-scale turbine missile concrete impact experiments, 6:25538 (SAND—81-0353C)
CONTAINMENT SYSTEMS
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Air Cleaning Systems
Permeation cascades for the separation of krypton and xenon from nuclear reactor atmospheres, 6:25567
Separation of krypton and xenon by selective permeation, 6:25516
CONTAMINATION
(For radioactive contamination only; see also POLLUTION.)
Detection
Lightpipe luminoscope for monitoring occupational skin contamination, 6:26094
CONTINENTAL SHELF
Petroleum Deposits
Outer-continental shelf oil and gas leasing policy, 6:25041 (DOE/PE/70278—T14)
CONTROL SYSTEMS
(For automated processes including feedback.)
See also ON-LINE CONTROL SYSTEMS
Improved control strategy for wind-powered refrigerated storage of apples, 6:25432
Frequency Response Testing
Frequency response analysis of fluid control systems for parabolic-trough solar collectors, 6:25387
CONTROL THEORY (REACTOR)
See REACTOR KINETICS
COOLERS
See HEAT EXCHANGERS
COOLING SYSTEMS
See also PASSIVE SOLAR COOLING SYSTEMS
SOLAR COOLING SYSTEMS
THERMONUCLEAR REACTOR COOLING SYSTEMS
Environmental Effects
Ecological investigations at power plant cooling lakes, reservoirs, and ponds: an annotated bibliography. Final report, 6:26324 (EPRI-EA—1874)
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)
COOLING TOWERS
See also MECHANICAL DRAFT COOLING TOWERS
NATURAL DRAFT COOLING TOWERS
Air Pollution
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume I. Dispersion from single and multiple source natural draft cooling towers. Technical report, 6:25459 (NUREG/CR—1581-V-1)
Environmental Effects
Environmental assessment of cooling tower drift and vapor emissions for the proposed Vienna Unit No. 9, 6:25450 (PB—81-119737)
Plumes
Environmental assessment of cooling tower drift and vapor emissions for the proposed Vienna Unit No. 9, 6:25450 (PB—81-119737)
COOLING WATER CHEMICAL TREATMENT
See WATER CHEMISTRY
COPPER
Biochemical Reaction Kinetics
Photochemistry and enzymology of photosynthesis. Progress report, November 1, 1978-May 31, 1981, 6:26308 (DOE/ER/03326—101)
Biological Effects
Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Frenkel Defects
Computer simulation study of the displacement threshold-energy surface in Cu, 6:25920
Photoemission
Photoemission measurements for low energy x-ray detector applications, 6:26609 (LA-UR—81-1712)
Physical Radiation Effects
Determination of the threshold-energy surface for copper using in-situ electrical-resistivity measurements in the high-voltage electron microscope, 6:25919
Spectral Reflectance
Reflectance modification through controlled surface texturing by sputter etching, 6:25383
Sputtering
Reflectance modification through controlled surface texturing by sputter etching, 6:25383
COPPER SULFIDES
Physical Properties
Controlling influence of the Cu/sub 2/S optical absorption coefficient on the short-circuit currents of cu/sub 2/S/CdS solar cells, 6:25273
CORE BARREL
See CORING EQUIPMENT
CORING EQUIPMENT
Design
Summary of pressure coring developments, 6:24994 (DOE/BETC/IC—80/3(Vol.1))
Field Tests
Summary of pressure coring developments, 6:24994 (DOE/BETC/IC—80/3(Vol.1))
CORN (MAIZE)
See MAIZE
CORN STOVER
See AGRICULTURAL WASTES
CORROSION FATIGUE
Research Programs
Basic research needs and opportunities at the solid-liquid interface, 6:25243 (CONF-8006156—)
COSMIC PARTICLES
See COSMIC RADIATION
COSMIC RADIATION
Anisotropy
Large-angular-scale anisotropy in the cosmic background radiation, 6:26433
COUNTERS (RADIATION)
See RADIATION DETECTORS
COUNTY BUILDINGS
See PUBLIC BUILDINGS
COURT BUILDINGS
See PUBLIC BUILDINGS
CRABS
See CRUSTACEANS

CRATERING EXPLOSIONS
Mathematical Models
Calculations of cratering experiments with the bedded crack model, 6:25080 (LA-UR—81-1659)
CRBR REACTOR
See CLINCH RIVER BREEDER REACTOR
CREEKS
See RIVERS
CRITICAL ASSEMBLIES
See ZERO POWER REACTORS
CROPS
Productivity
Effects of simulated acidic rainfalls on yields of field-grown radishes and garden beets, 6:26331 (BNL—29433)
Influence of rainfall composition on the yield and quality of agricultural crops, 6:26334 (CONF-800365—)
CROSS SECTIONS
Data Analysis
Data interpretation, objective evaluation procedures and mathematical techniques for the evaluation of energy-dependent ratio, shape and cross section data, 6:26596 (CONF-800979—19)
CRUDE OIL
See PETROLEUM
CRUSTACEANS
See also DAPHNIA
ZOOPLANKTON
Tolerance
Mussels and crustaceans: studies of 1000 lakes in Norway, 6:26375 (CONF-800365—)
CRYOGENICS
Research Programs
Fundamental experiment at liquid helium temperature. Final report 1 Oct 74-31 Sep 79, 6:26012 (AD—A-090549)
CRYSTAL LATTICES
Computerized Simulation
Theoretical studies of shock dynamics in two-dimensional structures. V. Microscopic constraints on shock-induced signals, 6:26615 (UCRL—85288)
Microstructure
Theoretical studies of shock dynamics in two-dimensional structures. V. Microscopic constraints on shock-induced signals, 6:26615 (UCRL—85288)
Shock Waves
Theoretical studies of shock dynamics in two-dimensional structures. V. Microscopic constraints on shock-induced signals, 6:26615 (UCRL—85288)
CRYSTALS
Orientation
Optical diffraction technique for determination of crystal orientations, 6:25926
CULTIVATION TECHNIQUES
Steady-State Conditions
Steady-state zooplankton community in a feedback culture system, 6:26228
CYCLOTRON INSTABILITY
Dispersion Relations
Interaction of lower hybrid wave fields with drift-cyclotron loss-cone instability, 6:26652
CYCLOTRONS
Uses
Mass spectrometry with a very small cyclotron, 6:26071 (LBL—12797)
CYLINDRICAL PARABOLIC COLLECTORS
See PARABOLIC TROUGH COLLECTORS
CZECHOSLOVAKIA
Air Pollution
Analysis of atmospheric precipitation in Czechoslovakia, 6:26128 (CONF-800365—)
Research Programs
East Europe report: scientific affairs, No. 706, 6:26715 (JPRS—78269)

D

D PLUS RESONANCES
See D-1865 RESONANCES
D RESONANCES
See also D-1865 RESONANCES
D-2007 RESONANCES
Hadronic Particle Decay
Diffractive hadroproduction of charmed D mesons, 6:26499
Measurements of the properties of D-meson decays, 6:26486
Isospin
Nonleptonic decays of charmed mesons. Part 3. Tests of isospin selection rules in exclusive and semi-inclusive decays of charged D-mesons, 6:26558
Lifetime
Nonleptonic decays of charmed mesons. Part 1. Remarks on the differing lifetimes of charmed mesons, 6:26435
Mass Spectra
Diffractive hadroproduction of charmed D mesons, 6:26499
Particle Decay
Recent results on decays of D mesons from Mark II, 6:26507
Particle Production
Diffractive hadroproduction of charmed D mesons, 6:26499
Semileptonic Decay
Measurements of the properties of D-meson decays, 6:26486
Recent results on decays of D mesons from Mark II, 6:26507
D ZERO RESONANCES
See D-1865 RESONANCES
D* PLUS RESONANCES
See D-2007 RESONANCES
D* ZERO RESONANCES
See D-2007 RESONANCES
D-1865 RESONANCES
Lifetime
Nonleptonic decays of charmed mesons. Part 1. Remarks on the differing lifetimes of charmed mesons, 6:26435
Weak Hadronic Decay
Importance of the Keta and Keta′ decay modes in understanding charmed and other meson decays, 6:26529
Nonleptonic decays of charmed mesons. Part 2. Tests for the pole model in exclusive and semi-inclusive decays of the D^0-meson, 6:26557
D-2007 RESONANCES
Particle Production
Charmed-meson production in 200-GeV/c pion-beryllium interactions, 6:26482 (DOE/ER/03072—120)
DAIRY INDUSTRY
Energy Consumption
Energy aspects and potential energy savings of the new DASI process for milk sterilization, 6:25813
Energy Efficiency
Energy savings in milk production: mechanical vapour-recompression concentration (comparison to classical technology), 6:25772 (CONF-800272—)
Solar Process Heat
Industrial applications analysis: market characterization and system definition for several industries, 6:25348 (SERI/TP—353-467)
Total Energy Systems
Combined generation of electricity and heat in the dairy industry, 6:25803
DAMAGING NEUTRON FLUENCE
Comparative Evaluations
Comparison of fission fragment damage with fast neutron damage in metals, 6:25931
DAPHNIA
Population Dynamics
Responses of aquatic microcosms to acute mortality, 6:26234
DARRIEUS ROTORS
Aerodynamics
Fixed-wake analysis of the Darrieus rotor, 6:25426 (SAND—81-7026)
Vortex model of the Darrieus turbine: an analytical and experimental study. Final report, 6:25425 (SAND—81-7017)
Dynamic Loads
Torque ripple in a Darrieus, vertical axis wind turbine, 6:25433

Fatigue
VAWTDYN--a numerical package for the dynamic analysis of vertical axis wind turbines, 6:25434
Irrigation
Wind assisted deep-well pumping, 6:25429
Pumps
Wind assisted deep-well pumping, 6:25429
Stress Analysis
Vortex model of the Darrieus turbine: an analytical and experimental study. Final report, 6:25425 (SAND—81-7017)

DATA ACQUISITION SYSTEMS
See also CAMAC SYSTEM
Isolated data-acquisition system, 6:26723 (SAND—80-1952)
Memory Devices
FASTBUS introduction and demonstration, 6:26090 (SLAC-PUB—2738)
Microprocessors
Improved data-reduction methods for laser-pulse-diffusivity determination with the use of minicomputers, 6:26724 (SAND—80-2602C)

DATA STORAGE DEVICES
See MEMORY DEVICES

DATA TRANSMISSION
Radio Equipment
Field demonstrations of communication systems for distribution automation. Final report, 6:25476 (EPRI-EL—1860(Vol.4))

DC TO AC INVERTERS
See INVERTERS

DEALERS
See MARKETERS

DECANE
Phase Studies
Studies of aqueous solutions and microemulsions for enhanced oil recovery processes, 6:25053 (DOE/BETC/IC—80/3(Vol.2))

DECONTAMINATION
Cost Benefit Analysis
Engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25122 (DOE/UMT—0103)
Summary of the engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25123 (DOE/UMT—0103S)
Technology Assessment
Engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25122 (DOE/UMT—0103)
Summary of the engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25123 (DOE/UMT—0103S)

DEEP INELASTIC SCATTERING
Fluctuations
Experimental evidence and theoretical implications of fluctuations in deep inelastic heavy ion collisions, 6:26574 (LBL—12596)

DEER
Behavior
Animal Investigation Program: Nevada Test Site and Vicinity. Annual report, 1979, 6:26196 (DOE/DP/00539—042)

DEFECTS
(Not for CRYSTAL DEFECTS.)
Stress Analysis
Displacement discontinuity method applied to NDE-related stress problems, 6:26045 (IS-M—328)

DEHUMIDIFIERS
Energy Efficiency Standards
Background document for the advanced notice of proposed rulemaking for dishwashers, television sets, clothes washers, humidifiers and dehumidifiers. Topical report subtask 1.1: consumers products minimum energy efficiency standards program, 6:25726 (SAI—026-79-855-LJ)

DELAWARE
Resource Recovery Facilities
Raytheon Service Company experience and programs in resource recovery, 6:26057 (ANL/CNSV-TM—60)
Wind Power
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)

DEMONSTRATION PLANTS
See also INDUSTRIAL PLANTS
Permits
Kentucky Department for Natural Resources and Environmental Protection: permit application for air contaminant source. Supplement II, 6:24857 (DOE/OR/03054—T5)

DEOXYPENTOSE NUCLEIC ACID
See DNA

DEOXYRIBONUCLEIC ACID
See DNA

DEPOSITION
See also CHEMICAL VAPOR DEPOSITION
Mathematical Models
Atmospheric transport of pollutants, 6:26115 (CONF-800365—)

DEREGULATION
Economic Impact
Preliminary analysis of the natural gas market-ordering problem, 6:25073 (UT/CES-PS—15)

DESALINATION PLANTS
Boilers
Design study of the VTE boiler cycle for the desalination of sea water. Volume 1. Main report and Appendix A. Final report, 6:25449 (PB—81-113151)
Waste Heat Utilization
Use of heat from dual-purpose central station for desalting applications (Book chapter), 6:25622

DESICCANTS
Solar Drying
Solid desiccant regeneration by direct solar energy for fresh fruit drying, 6:25357

DESOXYRIBONUCLEIC ACID
See DNA

DETECTORS (RADIATION)
See RADIATION DETECTORS

DETONATION WAVES
See SHOCK WAVES

DETRITUS
Biodegradation
Effects of acidification on the dynamics of allochthonous leaf material and benthic invertebrate communities in running waters, 6:26367 (CONF-800365—)
PH Value
Acid precipitation and soil buffering capacity, 6:26336 (CONF-800365—)

DEUTERIDES
Thermal Diffusivity
Method for fast pulsed thermal diffusivity measurements in thin films, 6:26614 (SAND—80-2694C)

DEUTERIUM
Hot Atom Chemistry
Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2i + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$, 6:26006
Ion-Molecule Collisions
Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2^+ + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$, 6:26006
Isotope Effects
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)
Isotopic Exchange
Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2^+ + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$, 6:26006
Quadrupole Moments
Quadrupole interactions in liquid and solid deuterium, 6:25981 (MLM—2817(OP))

DEUTERIUM IONS
Beam Neutralization
Possible non-hydrogen neutralizers for high energy D^+ and H^+ beams, 6:26704 (PPPL—1803)
Collisions
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)

DEUTERIUM OXIDES
See HEAVY WATER
DEUTERON REACTIONS
Elastic Scattering
Collective and neutron-structure effects in the elastic scattering of vector polarized deuterons in the A = 90 mass region, 6:26584
Stripping
Beta-ray branching in the decay of ^{20}F, 6:26580
Total Cross Sections
Nuclear cross sections for light ions on ^{6}Li (100 keV to several MeV), 6:26577 (CONF-801111—47)
DEUTERON-DEUTERON INTERACTIONS
See DEUTERON REACTIONS
DEVELOPING COUNTRIES
Food
Foreign travel report (Needs), 6:25323 (CONF-790203—)
Water Pumps
Foreign travel report (Needs), 6:25323 (CONF-790203—)
DEVONIAN SHALES
See BLACK SHALES
DEXTRAN
Rheology
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
Synthesis
Synthesis, characterization and rheological behavior of model acrylamide randqm and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
DIAL PAINTERS
Personnel Dosimetry
Radiological protection program for a tritium luminous dial painting plant, 6:26322
Radiation Protection
Radiological protection program for a tritium luminous dial painting plant, 6:26322
DIAMOND DRILLING EQUIPMENT
See DRILLING EQUIPMENT
DIAPHRAGMS (THERMONUCLEAR DEVICE)
See LIMITERS
DIATOMS
Sensitivity
Impact of acid precipitation on diatoms and chemistry of Dutch moorland pools, 6:26364 (CONF-800365—)
Stratigraphy
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. II. Diatom stratigraphy and inferred pH, 6:26272 (CONF-800365—)
DIBARYON RESONANCES
Case for exotic baryon-baryon states, 6:26519 (ANL-HEP-CP—80-75)
Particle Identification
Measurement of the difference in pn total cross sections in pure longitudinal spin states, 6:26489
Measurement of the difference in pn total cross sections in pure longitudinal spin states, 6:26490
DIESEL ENGINES
Cogeneration
Industry/DOE diesel cogeneration demonstration program, 6:25767 (CONF-800272—)
Diesel Fuels
Distillate shale oil/diesel engine operating compatibility, 6:25795 (DOE/BETC/IC—80/3(Vol.4))
Engine tests using high-sulfur diesel fuel. Final report, 6:25851 (AD—A-090142)
Operation of medium-speed diesel engines on blends of middle distillate SRCII with No. 2D oil, 6:25861 (DOE/BETC/IC—80/3(Vol.4))
Exhaust Gases
Emissions characteristics of light-duty diesel vehicles, 6:25859 (DOE/BETC/IC—80/3(Vol.4))
Feasibility of operating medium-speed diesel engines with coal derived liquids, 6:25439 (DOE/BETC/IC—80/3(Vol.4))
Informational report: 1979 progress of the chemical characterization panel of the composition of diesel exhaust project and results of particulate extraction round-robin, 6:26158 (PB—81-114670)
Physical and chemical phenomena responsible for odor formation in diesel engines. Interim progress report Jul 78-Dec 79, 6:25874 (PB—81-119166)
Fuel Economy
Emissions characteristics of light-duty diesel vehicles, 6:25859 (DOE/BETC/IC—80/3(Vol.4))
Fuel Substitution
Feasibility of operating medium-speed diesel engines with coal derived liquids, 6:25439 (DOE/BETC/IC—80/3(Vol.4))
Operation
Feasibility of operating medium-speed diesel engines with coal derived liquids, 6:25439 (DOE/BETC/IC—80/3(Vol.4))
DIESEL FUELS
Coal Liquids
Feasibility of operating medium-speed diesel engines with coal derived liquids, 6:25439 (DOE/BETC/IC—80/3(Vol.4))
Decomposition
Optimization of accelerated stability-test techniques for diesel fuels. Final report, 6:25052 (DOE/BC/10043—25)
Environmental Effects
Emissions characteristics of light-duty diesel vehicles, 6:25859 (DOE/BETC/IC—80/3(Vol.4))
Fire Resistance
Investigation of fire-vulnerability-reduction effectiveness of fire-resistant diesel fuel in armored vehicular fuel tanks. Final report 25 Sep 79-30 Sep 80, 6:25051 (AD—A-090129)
Fuel Additives
Engine tests using high-sulfur diesel fuel. Final report, 6:25851 (AD—A-090142)
Research Programs
Distillate shale oil/diesel engine operating compatibility, 6:25795 (DOE/BETC/IC—80/3(Vol.4))
Feasibility of operating medium-speed diesel engines with coal derived liquids, 6:25439 (DOE/BETC/IC—80/3(Vol.4))
Operation of medium-speed diesel engines on blends of middle distillate SRCII with No. 2D oil, 6:25861 (DOE/BETC/IC—80/3(Vol.4))
Stability
Accelerated stability test techniques for middle distillate fuels, 6:25060 (DOE/BETC/IC—80/3(Vol.4))
Optimization of accelerated stability-test techniques for diesel fuels. Final report, 6:25052 (DOE/BC/10043—25)
Storage
Optimization of accelerated stability-test techniques for diesel fuels. Final report, 6:25052 (DOE/BC/10043—25)
Testing
Optimization of accelerated stability-test techniques for diesel fuels. Final report, 6:25052 (DOE/BC/10043—25)
DIFFERENTIAL EQUATIONS
See also RICCATI EQUATION
Analytical Solution
Adaptive-mesh zoning by the equipotential method, 6:26627 (UCID—19062)
DIFFRACTION MODELS
Differential Cross Sections
Dip and kink structures in high energy diffraction dissociation processes, 6:26530
DIFFUSE SOLAR RADIATION
Monitoring
Diffuse sky measurements and determination of corrected shadow band multiplication factors, 6:25228
DIFFUSERS
Design
Subsonic diffusers for MHD generators, 6:25653
DIMERS
Radioinduction
Irreversible denaturation mapping of a pyrimidine-rich domain of a complex satellite DNA, 6:26318
DIMETHYLBENZENES
See XYLENES

DIOPSIDE
Thermodynamic Properties
Thermodynamic properties of crystals and melts based on calorimetric data and plagioclass-melt equilibria in the system albite-anorthite-diposide, 6:26427 (DOE/ER/10765—T1)
DIRECT CONTACT HEAT EXCHANGERS
Feasibility Studies
Direct-contact heat exchangers for OTEC: some advantages and disadvantages, 6:25315 (CONF-810622—5)
Working Fluids
Direct-contact heat exchangers for OTEC: some advantages and disadvantages, 6:25315 (CONF-810622—5)
DIRECT GAIN SYSTEMS
Design
Solar Atrium: a hybrid solar heating and cooling system, 6:25337 (DOE/CS/34135—T4)
Monitoring
Passive solar in Milton Keynes, 6:25370
Performance Testing
Solar Atrium: a hybrid solar heating and cooling system, 6:25337 (DOE/CS/34135—T4)
DIRECTORIES
Energy-efficiency directory of refrigerators and refrigerator-freezers, 6:25719 (DOE/CS/20315—T11)
DISHWASHERS
Energy Efficiency Standards
Background document for the advanced notice of proposed rulemaking for dishwashers, television sets, clothes washers, humidifiers and dehumidifiers. Topical report subtask 1.1: consumers products minimum energy efficiency standards program, 6:25726 (SAI—026-79-855-LJ)
DISPERSANTS (CHEMICAL)
See SURFACTANTS
DISPERSION RELATIONS
Cyclotron Instability
Effects of the fast wave on the drift-cyclotron loss-cone mode, 6:26653
DISPERSION THEORY
See DISPERSION RELATIONS
DISTRIBUTION
(For energy distribution see ENERGY SPECTRA.)
Mathematical Models
Dispersion of radioactive pollutant in a tornadic storm, 6:26165 (DP—1556)
DISTRICT HEATING
Coupling technology for dual-purpose central station power plants (Book chapter), 6:25620
Dual-Purpose Power Plants
Use of heat from dual-purpose power stations for district heating (Book chapter), 6:25621
Economic Impact
Indirect benefits of cogeneration district heating, 6:25624
Evaluation
Potential role of district heating in the US, 6:25834 (BNL—29282)
Hot Water
Use of heat from dual-purpose power stations for district heating (Book chapter), 6:25621
Payback Period
Group solar housing, 6:25371
Socio-Economic Factors
Potential role of district heating in the US, 6:25834 (BNL—29282)
DISULFIDES
Desulfurization
Chemical studies of the Ames oxydesulfurization process, 6:24911
DMSO
(Dimethyl sulfoxide.)
Photochemical Reactions
Electron photoejection in carbanions. Progress report, July 1, 1980-June 30, 1981, 6:25998 (DOE/ER/10424—1)
DNA
(Deoxyribonucleic acid.)
Nucleic Acid Denaturation
Irreversible denaturation mapping of a pyrimidine-rich domain of a complex satellite DNA, 6:26318
DODECANE
Dielectric Properties
Dielectric relaxation of oil-external microemulsions, 6:25994
DOLOMITE
Sorptive Properties
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
DOMED STRUCTURES
Construction
Earth shelters by inflation formed thin shell domes, 6:25706 (CONF-800438—)
DORMITORIES
See RESIDENTIAL BUILDINGS
DOSEMETERS
Physical Radiation Effects
Evaluation of military radiac equipment, 6:26100 (AD—460281)
DOSIMETRY
See also GAMMA DOSIMETRY
NEUTRON DOSIMETRY
X-RAY DOSIMETRY
Lyoluminescence
Lyoluminescent dosimetric materials and their response to ionizing radiation, 6:26084
DOUBLET 3 DEVICES
See DOUBLET REACTORS
DOUBLET REACTORS
Magnet Coils
Permissible-limit and flaw-size determination in an experimental fusion-reactor component, 6:26693 (GA-A—14847)
DOW PUSHER 700
See POLYAMIDES
DOWTHERM
See PHENYL ETHER
DRIFT INSTABILITY
Collisional drift waves in a plasma with electron temperature inhomogeneity, 6:26648
Dispersion Relations
Effects of the fast wave on the drift-cyclotron loss-cone mode, 6:26653
Interaction of lower hybrid wave fields with drift-cyclotron loss-cone instability, 6:26652
DRIFT TUBES
Beam Currents
Limiting currents in shielded source configurations, 6:26065
DRILL BITS
See also DRILLING EQUIPMENT
ROTARY DRILLS
Design
Summary of pressure coring developments, 6:24994 (DOE/BETC/IC—80/3(Vol.1))
Field Tests
Summary of pressure coring developments, 6:24994 (DOE/BETC/IC—80/3(Vol.1))
Hydraulics
Studies for the improvement of diamond drill bit hydraulics, 6:24995 (DOE/BETC/IC—80/3(Vol.1))
DRILL CORES
Materials Handling
Industrial survey of core handling, storage and analysis procedures for ROS measurements, 6:24985 (DOE/BETC/IC—80/3(Vol.1))
Permeability
Industrial survey of core handling, storage and analysis procedures for ROS measurements, 6:24985 (DOE/BETC/IC—80/3(Vol.1))
Porosity
Industrial survey of core handling, storage and analysis procedures for ROS measurements, 6:24985 (DOE/BETC/IC—80/3(Vol.1))
Storage
Industrial survey of core handling, storage and analysis procedures for ROS measurements, 6:24985 (DOE/BETC/IC—80/3(Vol.1))
DRILLING EQUIPMENT
See also CORING EQUIPMENT
DRILL BITS

Field Tests
Electrodril system field test program: Phase II, Task C deep drilling system demonstration, 6:26019 (DOE/BETC/IC—80/3(Vol.1))

DRILLING FLUIDS
Summary report on low invasion coring fluids, 6:24987 (DOE/BETC/IC—80/3(Vol.1))

Losses
Evaluation of equipment and methods to map lost circulation zones in geothermal wells, 6:25403 (SAND—80-7057)

Optimization
Optimization of air drilling operations, 6:24996 (DOE/BETC/IC—80/3(Vol.1))

DRILLING MUD
See DRILLING FLUIDS

DROPLETS

Coalescence
Dynamic interfacial properties and their effects on oil ganglia reconnection and displacement processes, 6:25024 (DOE/BETC/IC—80/3(Vol.2))
Mechanism of oil bank formation, coalescence in porous media and emulsion stability: II, 6:25017 (DOE/BETC/IC—80/3(Vol.2))

Phase Studies
Dynamic interfacial properties and their effects on oil ganglia reconnection and displacement processes, 6:25024 (DOE/BETC/IC—80/3(Vol.2))

DRY DEPOSITION
See DEPOSITION

DRY SCRUBBERS

Economics
Proceedings: symposium on flue-gas desulfurization, 6:24926 (EPA/600/9—81-019B)

Flowsheets
Proceedings: symposium on flue-gas desulfurization, 6:24926 (EPA/600/9—81-019B)

DUAL-PURPOSE POWER PLANTS
Utilization of reject heat (Book), 6:25617

Boilers
Design study of the VTE boiler cycle for the desalination of sea water. Volume 1. Main report and Appendix A. Final report, 6:25449 (PB—81-113151)

Desalination Plants
Use of heat from dual-purpose central station for desalting applications (Book chapter), 6:25622

District Heating
Use of heat from dual-purpose power stations for district heating (Book chapter), 6:25621

Systems Analysis
Coupling technology for dual-purpose central station power plants (Book chapter), 6:25620

DUCTS

Heat Transfer
Calibrated hot-box approach for steady-state heat-transfer measurements in air duct systems, 6:25762

Thermal Conductivity
Calibrated hot-box approach for steady-state heat-transfer measurements in air duct systems, 6:25762

DUSTS

Control
Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion, 6:24949

DYE LASERS

Electro-Optical Effects
Optogalvanic effect as a detector for intracavity atomic absorption in a cw dye laser, 6:26039

Line Widths
Unified single-pass model of linewidths in the Haensch, single- and double-grating grazing-incidence dye lasers, 6:26041

DYNAMIC INDUCER ROTORS
See IMPELLER ROTORS

DYSPROSIUM

Magnetic Properties
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)

Superconductivity
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)

E

EARTH ATMOSPHERE
See also AIR
IONOSPHERE
MAGNETOSPHERE

Boundary Layers
Lagrangian and Eulerian time-scale relations in the daytime boundary layer, 6:26103

Clouds
Climate change and cloud feedback: The possible radiative effects of latitudinal redistribution, 6:26108

Long Wave Radiation
Climate change and cloud feedback: The possible radiative effects of latitudinal redistribution, 6:26108

Turbulence
Lagrangian and Eulerian time-scale relations in the daytime boundary layer, 6:26103

EARTH PENETRATORS

Mathematical Models
TOODY-WONDY calculations of penetration events, 6:26062 (SAND—81-0050C)

Performance
TOODY-WONDY calculations of penetration events, 6:26062 (SAND—81-0050C)

EARTH-COVERED BUILDINGS
Taxonomy of underground space, 6:26202 (CONF-800438—)

Aesthetics
Aesthetics of the underground building, 6:25694 (CONF-800438—)

Architecture
Expression of earth sheltered architecture, 6:25700 (CONF-800438—)

Attitudes
Consumer evaluation of an earth sheltered solar residence, 6:25367
Earth shelter design revival: who's building what, where, 6:25707 (CONF-800438—)
Implications for habitability design and energy savings in earth sheltered housing, 6:25744

Construction
Earth sheltered concrete domes using a geodesic formwork, 6:25748
Earth shelters by inflation formed thin shell domes, 6:25706 (CONF-800438—)
Owner-builder and the underground: building a low-cost home, 6:25699 (CONF-800438—)
Precast concrete walls for earth sheltered construction, 6:25709 (CONF-800438—)
Shelterra earth homes structural shell and other general observations, 6:25701 (CONF-800438—)
Steel reinforced concrete shell structures: forming techniques, structural design, and earth sheltered applications, 6:25705 (CONF-800438—)

Cost
Affordable, earth sheltered, passive solar house, 6:25325 (CONF-800438—)
Shelterra earth homes structural shell and other general observations, 6:25701 (CONF-800438—)

Daylighting
Light distribution in three earth-embanked houses, 6:25743

Design
Design/development process for Underhill, a residence, 6:25366
Design innovations for a new minerals engineering building, 6:25740
Designer's first experience with troglodyte subculture, 6:25324 (CONF-800438—)
Detailing the earth sheltered building, 6:25693 (CONF-800438—)

Earth, energy, architecture and steel culvert construction, 6:25747
Earth sheltered concrete domes using a geodesic formwork, 6:25748
Earth tempering as a passive design strategy, 6:25362
Implications for habitability design and energy savings in earth sheltered housing, 6:25744
Thin shell roof systems and construction techniques for earth sheltered housing, 6:25746
Domed Structures
Earth covered barrel shell structures, 6:25745
Economics
Earth covered barrel shell structures, 6:25745
Operation characteristics of a utility-free dwelling in Kansas, 6:25363
Energy Conservation
Incorporating earth shelter considerations into the design process for nonresidential buildings, 6:25741
Energy Consumption
Earth sheltered passive solar structures: occupant comfort and energy use, 6:25365
Energy performance of an earth sheltered active solar house, 6:25364
Energy performance characteristics of selected earth sheltered residences, 6:25696 (CONF-800438—)
Energy usage in earth covered dwellings in Oklahoma, 6:25739
Energy Efficiency Standards
Energy performance characteristics of selected earth sheltered residences, 6:25696 (CONF-800438—)
Environmental Impacts
Incorporating earth shelter considerations into the design process for nonresidential buildings, 6:25741
Evaluation
Absolutely constant incontestably stable architectural value scale, 6:25742
Financing
Earth shelter design revival: who's building what, where, 6:25707 (CONF-800438—)
Health Hazards
Lithotecture of Australia: with specific reference to user health factors, 6:25735
Heat Gain
Analysis of transient heat loss in earth sheltered structures, 6:25738
Heat Losses
Analysis of transient heat loss in earth sheltered structures, 6:25738
Simple method for determining heat flow through earth covered roofs, 6:25737
Heating Load
Energy performance of an earth sheltered active solar house, 6:25364
Indoor Air Pollution
Ionizing radiation levels in energy conserving structures, 6:26164 (CONF-800438—)
Landscaping
Rooftop plantings for earth covered buildings in temperate climates, 6:25736
Legal Aspects
Potential problems of legal liability in the design, construction and ownership of an earth shelter, 6:25703 (CONF-800438—)
Restrictive covenants: a barrier to earth sheltering, 6:25704 (CONF-800438—)
Marketing
Earth shelter design revival: who's building what, where, 6:25707 (CONF-800438—)
Selling earth sheltered homes, 6:25708 (CONF-800438—)
Meetings
Earth shelter 2. 1979-1980 USC Series, 6:25692 (CONF-800438—)
Proceedings: earth sheltered building design innovations, 6:25732
Ownership
Owner-builder and the underground: building a low-cost home, 6:25699 (CONF-800438—)
Passive Solar Cooling Systems
Consumer evaluation of an earth sheltered solar residence, 6:25367
Earth sheltered passive solar structures: occupant comfort and energy use, 6:25365
Earth tempering as a passive design strategy, 6:25362
Lithotecture of Australia: with specific reference to thermal factors, 6:25734
Operation characteristics of a utility-free dwelling in Kansas, 6:25363
Passive Solar Heating Systems
Affordable, earth sheltered, passive solar house, 6:25325 (CONF-800438—)
Consumer evaluation of an earth sheltered solar residence, 6:25367
Design/development process for Underhill, a residence, 6:25366
Earth sheltered passive solar structures: occupant comfort and energy use, 6:25365
Earth tempering as a passive design strategy, 6:25362
Operation characteristics of a utility-free dwelling in Kansas, 6:25363
Radiation Hazards
Ionizing radiation levels in energy conserving structures, 6:25610
Reviews
Expression of earth sheltered architecture, 6:25700 (CONF-800438—)
Oklahoma earth shelters: a state-of-the-art review, 6:25697 (CONF-800438—)
Roofs
Shelterra earth homes structural shell and other general observations, 6:25701 (CONF-800438—)
Site Selection
High bank instead of high rise, 6:25702 (CONF-800438—)
Integrating site locational criteria for underground housing, 6:25698 (CONF-800438—)
Investigations into ground climate as an alternative thermal building environment, 6:26194 (CONF-800438—)
Solar Cooling Systems
Energy performance of an earth sheltered active solar house, 6:25364
Solar Heating Systems
Energy performance of an earth sheltered active solar house, 6:25364
Solar Space Heating
Designer's first experience with troglodyte subculture, 6:25324 (CONF-800438—)
Solar Water Heaters
Consumer evaluation of an earth sheltered solar residence, 6:25367
Operation characteristics of a utility-free dwelling in Kansas, 6:25363
Specifications
Shelterra earth homes structural shell and other general observations, 6:25701 (CONF-800438—)
Thermal Insulation
Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations, 6:25687
EARTHQUAKES
Seismic Effects
Impact of the January-February 1980 earthquake sequence on various structures at the Lawrence Livermore National Laboratory, 6:25171 (UCRL—85460)
EARTHWORMS
See ANNELIDS
E-BEAM TYPE REACTORS
Research Programs
Particle beam fusion progress report, January-June 1980, 6:26706 (SAND—80-2500)
EBR-2 REACTOR
Air Cleaning Systems
Breached-pin testing in the US, 6:25495 (HEDL-SA—2405-FP)
Fuel Pins
Experimental and calculational results of an irradiation experiment in EBR-II, 6:25507 (CONF-810606—55)

Off-Gas Systems
Breached-pin testing in the US, 6:25495 (HEDL-SA—2405-FP)

ECOLOGICAL COMMUNITIES
See ECOSYSTEMS

ECOLOGY
Bibliographies
Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2 supplement, ecological sciences, 6:26391 (PNL—3700Pt.2Suppl.)

ECOSYSTEMS
See also AQUATIC ECOSYSTEMS
TERRESTRIAL ECOSYSTEMS
Acidification
Sensitivity of the United States environment to acid precipitation, 6:26123 (CONF-800365—)
Biological Models
Microcosms in ecological modeling, 6:26217
Meetings
Microcosms in ecological research, 6:26212
Microcosms
Are microcosms useful for ecosystem analysis, 6:26226
Large-scale microcosms for assessing fates and effects of trace contaminants, 6:26221
Microcosm approach to the study of biogeochemical systems. I. Theoretical rationale, 6:26219
Simulation
New paradigm for the examination of closed ecosystems, 6:26214

ECR HEATING
Distribution Functions
Electron-cyclotron-resonant-heated electron distribution functions, 6:26645 (UCRL—85826)

EDUCATIONAL FACILITIES
See also SCHOOL BUILDINGS
Steam Generators
Industrial application of fluidized-bed combustion. Quarterly technical progress report, October-December, 1980, 6:26060 (DOE/ET/10381—150)

EFFECTIVE RANGE THEORY
Strong-Coupling Model
Numerical computation of the renormalized effective potential in the strong-coupling limit, 6:26528

EFFLUENTS (CHEMICAL)
See CHEMICAL EFFLUENTS

EHF RADIATION
See MICROWAVE RADIATION

EHV AC SYSTEMS
Superconducting Cables
Semiannual report for the period April 1-September 30, 1980 of work on: (1) superconducting power transmission system development; and (2) cable insulation development, 6:25452 (BNL—51329)

ELASTOMERS
See also RUBBERS
Chemical Preparation
Evaluation of organic peroxides as curing agents for methylphenylvinyl-siloxane elastomers used for cellular silicone cushions, 6:25941 (UCRL—53124)
Cost
Low-cost, efficient and durable low-temperature solar collector, 6:25386
Efficiency
Low-cost, efficient and durable low-temperature solar collector, 6:25386
Radiation Effects
Influence of Co-60 γ-ray on the stress relaxation of SBS type thermoplastic elastomer, 6:25943
Service Life
Low-cost, efficient and durable low-temperature solar collector, 6:25386

ELDERLY PEOPLE
Transport
User-side subsidies for shared-ride taxis in Kinston, North Carolina. Final report, 6:25756 (UMTA-NC—06-0002-80-1)

ELECTRIC BATTERIES
(Devices for production and/or storage of electrical energy from chemical reactions; excludes FUEL CELLS and RADIOISOTOPE BATTERIES.)
See also LEAD-ACID BATTERIES
Economic Analysis
Storage in residential solar total-energy systems, 6:25389 (BNL—51230)
Electrodes
The charge and discharge behavior of molybdenum trioxide electrodes in lithium perchlorate-propylene carbonate electrolyte. Technical report, 6:25581 (AD—A-090346)
Research Programs
Progress and forecast in electric-vehicle batteries, 6:25878 (CONF-800939—2)
Testing
Testing batteries for photovoltaic power systems, 6:25589 (SAND—81-0226C)

ELECTRIC CABLES
See also OIL-FILLED CABLES
SUPERCONDUCTING CABLES
Electrical Insulation
Experimental techniques for investigating the degradation of electrical insulation. Final report, 6:25473 (EPRI-EL—1854)

ELECTRIC CONDENSERS
See CAPACITORS

ELECTRIC CONTACTORS
See SWITCHES

ELECTRIC CONTACTS
Fabrication
Molybdenum-tin as a solar cell metallization system, 6:25279
Surface Coating
dc sputter gold deposition on beryllium-copper contacts, 6:26050 (BDX—613-2629)

ELECTRIC FIELDS
Biological Effects
Assessment of health impacts from electrical-power transmission lines, 6:26401 (UR—3490-2024)

ELECTRIC GENERATORS
(Rotating generators only; excludes DIRECT ENERGY CONVERTERS.)
See also SUPERCONDUCTING GENERATORS
WATER CURRENT POWER GENERATORS
Economic Analysis
Small hydro plant development program. Volume 1. Text, 6:25209 (DOE/ID/01570—T21(Vol.1))
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)
Performance
Small hydro plant development program. Volume 1. Text, 6:25209 (DOE/ID/01570—T21(Vol.1))
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)

ELECTRIC POWER
See also HYDROELECTRIC POWER
Consumption Rates
Socioeconomic impacts of time-of-day pricing by electric utilities: a case study of Philadelphia residential customers, 6:25637 (BNL—51326)
Rate Structure
Comparative class rates of return in the electric utility industry: a comparative study of electric rates charged to small business consumers. Final report, 6:25642 (PB—81-110322)

ELECTRIC POWER INDUSTRY
Coal Preparation
Cost benefits associated with the use of physically cleaned coal. Final report May 78-Nov 79, 6:24952 (PB—81-113953)

ELECTRIC SWITCHES
See SWITCHES

ELECTRIC UTILITIES
Contracts
Utility view of DOE's enrichment policies, 6:25098
Economics
Energy, capacity, and economic effects of cogeneration interfaced with electric-utility systems, 6:25438 (CONF-801210—27)

Flywheel Energy Storage
Study of flywheel energy storage system for electric utilities, 6:25577 (CONF-790203—)
Income
Comparative class rates of return in the electric utility industry: a comparative study of electric rates charged to small business consumers. Final report, 6:25642 (PB—81-110322)
Load Management
Field demonstrations of communication systems for distribution automation. Final report, 6:25476 (EPRI-EL—1860(Vol.4))
Field demonstrations of communication systems for distribution automation. Final report, 6:25475 (EPRI-EL—1860(Vol.3))
Field demonstrations of communication systems for distribution automation. Final report, 6:25474 (EPRI-EL—1860(Vol.2))
Nuclear Power Plants
Shared responsibilities of the utility and the media in crisis situations, 6:25549
Study of factors governing US utility nuclear power decisions, 6:25482 (DOE/ET/34009—T1)
Three Mile Island in perspective: keynote address, 6:25540
Power Distribution
Field demonstrations of communication systems for distribution automation. Final report, 6:25474 (EPRI-EL—1860(Vol.2))
Power Distribution Systems
Broadcast radio system for distribution communications. Final report, 6:25477 (EPRI-EL—1868)
Profits
Comparative class rates of return in the electric utility industry: a comparative study of electric rates charged to small business consumers. Final report, 6:25642 (PB—81-110322)
Rate Structure
Socioeconomic impacts of time-of-day pricing by electric utilities: a case study of Philadelphia residential customers, 6:25637 (BNL—51326)
Reactor Safety
Three Mile Island nuclear accident: the other lesson, 6:25564

ELECTRICAL INSULATION
Aging
Experimental techniques for investigating the degradation of electrical insulation. Final report, 6:25473 (EPRI-EL—1854)
Materials Testing
Experimental techniques for investigating the degradation of electrical insulation. Final report, 6:25473 (EPRI-EL—1854)
Thermal Conductivity
Analysis of the applicability of the hot-wire technique for determination of the thermal conductivity of diathermanous materials, 6:25683

ELECTRICAL INSULATORS
Materials
Crystallized fly-ash feasibility study. Final report, 6:25802 (EPRI-EL—1836)

ELECTRIC-POWERED VEHICLES
Acid Electrolyte Fuel Cells
Design considerations for vehicular fuel cell power plants, 6:25670 (LA-UR—81-1054)
Ammonia Fuel Cells
Characteristics of an NH_3-air fuel cell system for vehicular applications, 6:25671 (LBL—12754)
Demonstration Programs
Electric and hybrid vehicle program. Quarterly report, January-February-March 1981, 6:25880 (DOE/CE—0011/14)
Electric Batteries
Near-term batteries for electric vehicles, 6:25586 (CONF-810315—13)
Progress and forecast in electric-vehicle batteries, 6:25878 (CONF-800939—2)
Environmental Impacts
Projection of US transportation needs for beyond 1990: a market for advanced vehicles, 6:25879 (CONF-801242—7)
Iron-Nickel Batteries
Status of nickel/zinc and nickel/iron battery technology for electric vehicle applications, 6:25584 (CONF-800612—6)
Market
Projection of US transportation needs for beyond 1990: a market for advanced vehicles, 6:25879 (CONF-801242—7)
Nickel-Zinc Batteries
Status of nickel/zinc and nickel/iron battery technology for electric vehicle applications, 6:25584 (CONF-800612—6)
Performance Testing
Baseline tests of the Electra Van Model 1000 electric vehicle. Test report 20 Sep-28 Nov 78, 6:25877 (AD—A-090113)
Power Demand
Projection of US transportation needs for beyond 1990: a market for advanced vehicles, 6:25879 (CONF-801242—7)
Research Programs
Electric and hybrid vehicle program. Quarterly report, January-February-March 1981, 6:25880 (DOE/CE—0011/14)
Technology Assessment
Baseline tests of the Electra Van Model 1000 electric vehicle. Test report 20 Sep-28 Nov 78, 6:25877 (AD—A-090113)

ELECTROCHEMICAL CORROSION
Research Programs
Basic research needs and opportunities at the solid-liquid interface, 6:25243 (CONF-8006156—)

ELECTRODES
Electrical Properties
Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)
Manufacturing
Method for manufacturing magnetohydrodynamic electrodes (Patent), 6:25655
Performance
The charge and discharge behavior of molybdenum trioxide electrodes in lithium perchlorate-propylene carbonate electrolyte. Technical report, 6:25581 (AD—A-090346)
Stability
Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)

ELECTROLYTES
See also SOLID ELECTROLYTES
Chemical Properties
Definition of chemical and electrochemical properties of a fuel cell electrolyte. Final technical report 25 Mar 77-24 Jun 80, 6:25661 (AD—A-089776)
Electrical Properties
Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)
Electrochemistry
Definition of chemical and electrochemical properties of a fuel cell electrolyte. Final technical report 25 Mar 77-24 Jun 80, 6:25661 (AD—A-089776)
Phase Studies
Phase equilibria for highly unsymmetrical plasmas and electrolytes, 6:26480
Stability
Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)

ELECTROMAGNETIC PULSES
Direct time-domain techniques for transient radiation and scattering from wires, 6:26625

ELECTROMAGNETIC RADIATION
See also ELECTROMAGNETIC PULSES
GAMMA RADIATION
LASER RADIATION
MICROWAVE RADIATION
Scattering
Direct time-domain techniques for transient radiation and scattering from wires, 6:26625
Transients
Direct time-domain techniques for transient radiation and scattering from wires, 6:26625

ELECTRON BEAM TARGETS
Boundary Conditions
Application of reparameterized Fourier descriptors of e-beam target boundaries, 6:26712 (SAND—81-1524C)

ELECTRON BEAM TYPE REACTORS
See E-BEAM TYPE REACTORS
ELECTRON BEAMS
Laminar Flow
Limiting currents in shielded source configurations, 6:26065
ELECTRON CONFIGURATION (ATOMS)
See ELECTRONIC STRUCTURE
ELECTRON CYCLOTRON-RESONANCE H
See ECR HEATING
ELECTRON PAIRS
Pair Production
Theory of positron production in heavy-ion collisions, 6:26466
ELECTRON REACTIONS
Deep Inelastic Scattering
Mesonic processes in deep-inelastic electron scattering from nuclei, 6:26607
Elastic Scattering
Applications of moment methods to finite nuclei, 6:26603 (IS-M—320)
Inclusive Interactions
Mesonic processes in deep-inelastic electron scattering from nuclei, 6:26607
ELECTRON SPECTRA
Reactor antineutrino spectra and their application to antineutrino-induced reactions II, 6:25501 (HEDL-SA—2303-FP)
ELECTRON-BEAM-PUMPED LASERS
See FREE ELECTRON LASERS
ELECTRONIC CIRCUITS
See also PRINTED CIRCUITS
Research Programs
Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)
ELECTRONIC EQUIPMENT
See also POWER SUPPLIES
RADIO EQUIPMENT
Design
Power shovel data accumulator and display, 6:24943 (DOE/PC/30205—T1)
ELECTRONIC STRUCTURE
(For electron configuration in atoms and molecules, and electron band structure in solids.)
Measuring Methods
Research with x rays, 6:26093
ELECTRON-MOLECULE COLLISIONS
Ionization
Doubly differential cross sections of secondary electrons ejected from gases by electron impact: 25 —250 eV on H_2, 6:26465
ELECTRON-NEUTRON INTERACTIONS
Elastic Scattering
Measurement of the elastic electron-neutron cross section at high Q^2, 6:26511
ELECTRON-POSITRON INTERACTIONS
Annihilation
(cc)-(anti canti c) (diquark-antidiquark) states in e^+e^- annihilation, 6:26554
First results on bare b physics, 6:26516
Measurements of the properties of D-meson decays, 6:26486
Radiative transitions from the psi(3095) and psi'(3684) to ordinary hadrons, 6:26514
Results from TASSO, 6:26086
Spin effects in e^+e^- annihilations, 6:26518 (ANL-HEP-CP—80-69)
TASSO results on jets and QCD, 6:26513
Two-photon results from SPEAR, 6:26512
Using e^+e^- cross-sections to test QCD and to search for new particles, 6:26549
Inclusive Interactions
Measurement of inclusive eta production in e^+e^- interactions near charm threshold, 6:26508
Jets
Results from TASSO, 6:26086
Spin
Spin effects in e^+e^- annihilations, 6:26518 (ANL-HEP-CP—80-69)
ELECTRON-PROTON INTERACTIONS
Elastic Scattering
Measurement of the elastic electron-neutron cross section at high Q^2, 6:26511
ELECTRONS
Collisions
Radiation from silver films bombarded by low-energy electrons, 6:26472
Mass Transfer
Photochemistry and enzymology of photosynthesis. Progress report, November 1, 1978-May 31, 1981, 6:26308 (DOE/ER/03326—101)
Pair Production
Anomalous low mass e^+e^- pair production in 17 GeV/c π^-p collisions, 6:26498
ELECTROSTATIC ANALYZERS
Performance
Large-acceptance-angle gridded analyzers in an axial magnetic field, 6:26644 (UCRL—52981)
ELECTROSTATIC PRECIPITATORS
Efficiency
Flue gas conditioning experience at Tampa Electric Company, 6:25455 (EPRI-WS—80-127)
Fly-ash conditioning: status and findings of EPRI program, 6:25456 (EPRI-WS—80-127)
Performance
Summary of discussion-group sessions on fly ash conditioning: coal firing, 6:25457 (EPRI-WS—80-127)
Performance Testing
A manual for the use of electrostatic precipitators to collect fly ash particles. Final report Dec 78-Feb 80, 6:25467 (PB—81-112757)
ELMO BUMPY TORUS
Quality Assurance
Quality-assurance approach for the Elmo Bumpy Torus Proof-of-Principal experiment, 6:26688 (CONF-810654—2)
EMERGENCY PLANS
Commonwealth of Pennsylvania emergency preparedness and response: the Three Mile Island incident, 6:25566
Energy Models
State energy modeling. Volume I. An analysis of state energy modeling, 6:25591 (DOE/CS/10046—2(Vol.1))
EMP
See ELECTROMAGNETIC PULSES
EMULSIONS
Dehydration
Electrostatic coalescence system with independent ac and dc hydrophilic electrodes (Patent), 6:25050
Demulsification
Produced fluid emulsions associated with surfactant-polymer flooding, 6:25014 (DOE/BETC/IC—80/3(Vol.2))
Stability
Mechanism of oil bank formation, coalescence in porous media and emulsion stability: II, 6:25017 (DOE/BETC/IC—80/3(Vol.2))
END USE SECTOR
See INDUSTRY
ENERGY
See also GEOTHERMAL ENERGY
NUCLEAR ENERGY
SOLAR ENERGY
Curriculum Guides
Guide for the preparation of proposals for faculty development projects in energy education, 1982, 6:25850 (DOE/ER—0103)
Indexes
1980 EIA Publications Directory: a user's guide, 6:25599 (DOE/EIA—0149-80)
Values
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
ENERGY AUDITS
Energy auditing and monitoring in local authorities, 6:25716 (CONF-7910214—)
Practical energy auditing, 6:25714 (CONF-7910214—)
ENERGY CASCADE
Industrial cogeneration (Book chapter), 6:25623
ENERGY CASCADING
See ENERGY CASCADE

ENERGY CONSERVATION
Handbook for the marketing of conservation and solar-energy programs, 6:25849 (DOE/CS/10210—T2)
Market outlook for energy-saving technologies in the US industrial sector, 6:25780 (CONF-800272—)
Utilization of reject heat (Book), 6:25617
Attitudes
Motivation: its role in energy conservation, 6:25847 (CONF-7910214—)
Comparative Evaluations
Cyclic reheat for FGD: status report. Final report, 6:25454 (EPRI-CS—1843)
Cost
Cyclic reheat for FGD: status report. Final report, 6:25454 (EPRI-CS—1843)
Financial Incentives
Impact of government incentives on the market for energy-saving technologies in the US industrial sector, 6:25781 (CONF-800272—)
Investment
Analysis of French investments in energy conservation technologies since 1974 and economic actions undertaken by the French government, 6:25782 (CONF-800272—)
Legal Incentives
Impact of government incentives on the market for energy-saving technologies in the US industrial sector, 6:25781 (CONF-800272—)
Meetings
Agricultural energy. Volume 2. Biomass energy crop production, 6:25275
Proceedings of second Franco-American conference on industrial energy conservation, 6:25763 (CONF-800272—)
ENERGY CONSUMPTION
Monitoring
Energy auditing and monitoring in local authorities, 6:25716 (CONF-7910214—)
ENERGY DEMAND
Computerized Simulation
Comparison of load determination methodologies for building energy-analysis programs. Final report, 6:25717 (DOE/CE/20184—1)
Economic Analysis
Energy/economic model analysis. Volume 1: gas technology assessments using three energy supply/demand integrating models. Final report, 6:25593 (PB—81-114225)
Energy/economic model analysis. Volume 2: evaluation of energy supply/demand integrating models. Final report, 6:25594 (PB—81-114233)
Energy/economic model analysis. Time-stepped energy system optimization model. Final report, 6:25595 (PB—81-114241)
Energy/economic model analysis. Livermore energy policy model. Final report, 6:25596 (PB—81-114266)
Energy/economic model analysis. Energy economic modeling system. Final report, 6:25597 (PB—81-114274)
Economic Elasticity
Aggregate elasticity of energy demand, 6:25628
Energy Models
State energy modeling. Volume I. An analysis of state energy modeling, 6:25591 (DOE/CS/10046—2(Vol.1))
Forecasting
Energy/economic model analysis. Volume 1: gas technology assessments using three energy supply/demand integrating models. Final report, 6:25593 (PB—81-114225)
Energy/economic model analysis. Volume 2: evaluation of energy supply/demand integrating models. Final report, 6:25594 (PB—81-114233)
Energy/economic model analysis. Time-stepped energy system optimization model. Final report, 6:25595 (PB—81-114241)
Energy/economic model analysis. Livermore energy policy model. Final report, 6:25596 (PB—81-114266)
Energy/economic model analysis. Energy economic modeling system. Final report, 6:25597 (PB—81-114274)
Energy to the year 2000: a comparison of energy strategies, 6:25627
Global Aspects
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation (Forecasting), 6:24968
Gross Domestic Product
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
Meetings
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation (Forecasting), 6:24968
ENERGY EFFICIENCY STANDARDS
Meetings
Building energy-performance-standards conference: Proceedings. Strategy paper number 12, 6:25691 (CONF-800277—)
Planning
Building energy-performance-standards conference: Proceedings. Strategy paper number 12, 6:25691 (CONF-800277—)
ENERGY FACILITIES
See also RESOURCE RECOVERY FACILITIES
Point Pollutant Sources
Mortality in 191 counties near energy facilities: use of economic and social variables for standardization, 6:26393
ENERGY INFORMATION ADMINISTRATION
Data Acquisition
Data collection and analysis. Part 1. Automated data collection process. Part 2. Data elements and reports, 6:25590 (DOE/EIA/11096—T1)
Forecasting
Energy to the year 2000: a comparison of energy strategies, 6:25627
Information Centers
1980 EIA Publications Directory: a user's guide, 6:25599 (DOE/EIA—0149-80)
Information Dissemination
1980 EIA Publications Directory: a user's guide, 6:25599 (DOE/EIA—0149-80)
ENERGY MANAGEMENT
Future of energy managers groups, 6:25625 (CONF-7910214—)
Education
Further education and training, 6:25848 (CONF-7910214—)
Meetings
International Energy Management Conference, 6:25674 (CONF-7910214—)
ENERGY MANAGEMENT SYSTEMS
Attitudes
Evaluation of the conservation potential of a refit energy management system (using a power line subcarrier) in a large, high-rise apartment complex, 6:25690 (BNL—51299)
ENERGY MODELS
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
State energy modeling. Volume I. An analysis of state energy modeling, 6:25591 (DOE/CS/10046—2(Vol.1))
Evaluation
Energy/economic model analysis. Volume 2: evaluation of energy supply/demand integrating models. Final report, 6:25594 (PB—81-114233)
Inventories
Energy modeling. Volume II. Inventory and details of state energy models (Book), 6:25592 (DOE/CS/10046—2(Vol.2))
Optimization
Energy/economic model analysis. Time-stepped energy system optimization model. Final report, 6:25595 (PB—81-114241)
Energy/economic model analysis. Macroeconomic impacts of research and development in gas supply and end use technologies. Final report, 6:25066 (PB—81-114258)
Energy/economic model analysis. Livermore energy policy model. Final report, 6:25596 (PB—81-114266)
Energy/economic model analysis. Energy economic modeling system. Final report, 6:25597 (PB—81-114274)
ENERGY POLICY
Policy implications of energy vulnerability, 6:25634
Bibliographies
Energy policy and research planning. October, 1977-September, 1980 (Citations from the NTIS Data Base). Report for Oct 77-Sep 80, 6:25631 (PB—81-800112)
Political Aspects
Sociopolitical effects of energy use and policy. Supporting paper 5, 6:25603 (PB—81-114894)

Social Impact
Energy choices in a democratic society. Supporting paper 7, 6:25602 (PB—81-114852)
Sociopolitical effects of energy use and policy. Supporting paper 5, 6:25603 (PB—81-114894)

ENERGY RECOVERY
See also HEAT RECOVERY
Municipal Wastes
Resouce recovery option in solid-waste management: a review guide for public officials , 6:25839 (DOE/CS/20156—T1)

ENERGY SHORTAGES
Government Policies
Department of Energy's reorganization of Energy contingency planning holds promise - but questions remain, 6:25633 (EMD—81-57)
Relaxing environmental standards during oil-supply disruptions: past, present and future, 6:26172 (DOE/PE/70278—T15)
Planning
Department of Energy's reorganization of Energy contingency planning holds promise - but questions remain, 6:25633 (EMD—81-57)

ENERGY SOURCE DEVELOPMENT
Feasibility Studies
Forest biomass for energy: a perspective, 6:25281
Planning
Energy plantation and the photosynthesis energy factory, 6:25285

ENERGY SOURCES
See also NUCLEAR FUELS
WASTE HEAT
WIND POWER
Economic Analysis
Perspective on alternative electric power sources, 6:25822
Risk Assessment
Risks and consequences in energy production, 6:25608

ENERGY STORAGE SYSTEMS
See also ELECTRIC BATTERIES
THERMAL ENERGY STORAGE EQUIPMENT
Comparative Evaluations
Future possibilities for energy-storage automobiles, 6:25881 (UCRL—85902)
Demonstration Programs
Program evaluation and review system for the Division of Energy Storage Systems. Final report, July 1, 1977-May 31, 1981, 6:25616 (DOE/ET/26704—7)
Redox Fuel Cells
Cost projections for redox energy-storage systems. Final report, April 30, 1979-September 30, 1979, 6:25666 (DOE/NASA/0126—1)
Research Programs
Program evaluation and review system for the Division of Energy Storage Systems. Final report, July 1, 1977-May 31, 1981, 6:25616 (DOE/ET/26704—7)
Reviews
Program evaluation and review system for the Division of Energy Storage Systems. Final report, July 1, 1977-May 31, 1981, 6:25616 (DOE/ET/26704—7)

ENERGY SUPPLIES
See also FUEL SUPPLIES
Economic Analysis
Energy/economic model analysis. Volume 1: gas technology assessments using three energy supply/demand integrating models. Final report, 6:25593 (PB—81-114225)
Energy/economic model analysis. Volume 2: evaluation of energy supply/demand integrating models. Final report, 6:25594 (PB—81-114233)
Energy/economic model analysis. Time-stepped energy system optimization model. Final report, 6:25595 (PB—81-114241)
Energy/economic model analysis. Livermore energy policy model. Final report, 6:25596 (PB—81-114266)
Energy/economic model analysis. Energy economic modeling system. Final report, 6:25597 (PB—81-114274)
Energy Models
State energy modeling. Volume I. An analysis of state energy modeling, 6:25591 (DOE/CS/10046—2(Vol.1))
Forecasting
Energy/economic model analysis. Volume 1: gas technology assessments using three energy supply/demand integrating models. Final report, 6:25593 (PB—81-114225)
Energy/economic model analysis. Volume 2: evaluation of energy supply/demand integrating models. Final report, 6:25594 (PB—81-114233)
Energy/economic model analysis. Time-stepped energy system optimization model. Final report, 6:25595 (PB—81-114241)
Energy/economic model analysis. Livermore energy policy model. Final report, 6:25596 (PB—81-114266)
Energy/economic model analysis. Energy economic modeling system. Final report, 6:25597 (PB—81-114274)
Energy to the year 2000: a comparison of energy strategies, 6:25627
Global Aspects
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation (Forecasting), 6:24968
Meetings
Coal Technology '80. Volume 1. New management challenges. Volume 2. Transportation (Forecasting), 6:24968

ENERGY SYSTEMS
Energy Efficiency
Thermoeconomics of energy systems. Progress report, June 1, 1980-May 30, 1981, 6:25799 (DOE/ER/10518—2)
Marketing Research
Market outlook for energy-saving technologies in the US industrial sector, 6:25780 (CONF-800272—)
Thermal Efficiency
Thermoeconomics of energy systems. Progress report, June 1, 1980-May 30, 1981, 6:25799 (DOE/ER/10518—2)

ENERGY TRANSPORT
See also NATURAL GAS DISTRIBUTION SYSTEMS
Mathematical Models
Modeling of water and solute transport under variably saturated conditions: state of the art (347 references), 6:25112 (CONF-801217—)

ENGINEERED SAFETY SYSTEMS
See also AIR CLEANING SYSTEMS
CONTAINMENT SYSTEMS
Safety considerations in the design and operation of light water nuclear power plants, 6:25541

ENGINEERING
Meetings
Eighteenth annual symposium on engineering geology and soils engineering, 6:26421

ENGLAND
See UNITED KINGDOM

ENHANCED RECOVERY
See also CARBON DIOXIDE INJECTION
MICROBIAL EOR
Support services on the enhanced oil recovery field test program (Support services by Gulf Universities Research Consortium), 6:25016 (DOE/BETC/IC—80/3(Vol.2))
Data Base Management
Improved computer-based system for managing information on enhanced oil recovery (EOR) and residual oil saturation (ROS), 6:24988 (DOE/BETC/IC—80/3(Vol.1))
Environmental Impacts
Environmental aspects and fluid flow characteristics of EOR systems, 6:25047 (DOE/BETC/IC—80/3(Vol.1))
Financial Incentives
Tertiary incentive crude oil program, 6:24980 (DOE/BETC/IC—80/3(Vol.1))
Health Hazards
Toxicity of chemical compounds used in enhanced oil recovery, 6:25040 (DOE/BETC/IC—80/3(Vol.1))
Information Needs
Determination of EOR technology transfer requirements: a survey of the data needs of the oil industry and other users of EOR technical information, 6:25032 (DOE/BETC/IC—80/3(Vol.4))
Information Systems
Characterization of the domestic oil resource for enhanced oil recovery, 6:24976 (DOE/BETC/IC—80/3(Vol.1))

Regulations
Compilation of a handbook of environmental regulations affecting enhanced oil recovery, 6:25031 (DOE/BETC/IC—80/3(Vol.4))
Research Programs
Enhanced oil recovery: chemical flooding. Annual report, October 1, 1979-September 30, 1980, 6:25000 (DOE/BETC/IC—80/3(Vol.2))
Tertiary oil recovery processes research at the University of Texas. Final report, October 1979-September 1980 (Surfactants, phase behavior, interfacial tension, solubilization), 6:24974 (DOE/BC/20001—10)
Technology Transfer
Determination of EOR technology transfer requirements: a survey of the data needs of the oil industry and other users of EOR technical information, 6:25032 (DOE/BETC/IC—80/3(Vol.4))
Water Resources
Oilfield water analysis data bank and estimates of water available for enhanced oil recovery in the northern shelf area of Oklahoma, 6:24978 (DOE/BETC/IC—80/3(Vol.1))

ENRICHED URANIUM
Prices
Utility view of DOE's enrichment policies, 6:25098
Production
DOE's enrichment services--a long range policy, 6:25613

ENTOMOLOGY
See INSECTS

ENTRAINMENT
Bibliographies
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)
Biological Effects
Effects of sublethal entrainment stresses on the vulnerability of juvenile bluegill sunfish to predation, 6:25462 (ORNL/TM—7801)

ENVIRONMENT
Management
Program standard for assuring that today's management obligations in environmental, safety, and health areas are met, 6:25607 (SAND—81-1359C)
Radiation Monitoring
Experience with an analytical quality-control program, 6:25976

ENVIRONMENTAL MATERIALS
Radiochemical Analysis
Experience with an analytical quality-control program, 6:25976

ENVIRONMENTAL POLICY
Management
Guidance for implementing an Environmental, Safety and Health Assurance Program. Volume 9. Model guidelines for environmental safety and health analysis activities, 6:26403 (SAND—81-0640)

ENVIRONMENTAL TRANSPORT
See also RADIONUCLIDE MIGRATION
RUNOFF
Mathematical Models
Models and criteria for LLW disposal performance, 6:25118 (CONF-801217—)
State-of-the-art in modeling solute and sediment transport in rivers, 6:26286 (CONF-801217—)

EOR
See ENHANCED RECOVERY

EPOXIDES
Chemical Preparation
CTBN variability study. Final report, 6:25944 (BDX—613-2565)
Physical Properties
CTBN variability study. Final report, 6:25944 (BDX—613-2565)

EPOXY COMPOUNDS
See EPOXIDES

EQUATIONS
See also DIFFERENTIAL EQUATIONS
Modeling of water and solute transport under variably saturated conditions: state of the art (347 references), 6:25112 (CONF-801217—)

EQUATIONS (DIFFERENTIAL)
See DIFFERENTIAL EQUATIONS

EQUILIBRIUM PLASMA
Neoclassical Transport Theory
Transport and isomorphic equilibria, 6:26642 (PPPL—1804)

ERBIUM
Magnetic Properties
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
Superconductivity
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)

ERBIUM 164
Giant Resonance
Observation of giant dipole resonances built on states of high energy and spin, 6:26588

ESTUARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS

ETA MESONS
Decay
Measurement of inclusive eta production in e^+e^- interactions near charm threshold, 6:26508
Particle Production
Measurement of inclusive eta production in e^+e^- interactions near charm threshold, 6:26508

ETA-549
See ETA MESONS

ETHANAL
See ACETALDEHYDE

ETHANOL
See also ETHANOL FUELS
GASOHOL
Biosynthesis
Enzymatic conversion of crop residue to glucose and alcohol, 6:25192 (DOE/R5/10131—2)
Hybrid biothermal conversion of biomass to liquid fuels, 6:25194
Chemical Analysis
Modified kit procedure for the kinetic assay of ethanol, 6:25196
Extraction
Gasohol by direct extraction of aqueous ferments. Interim progress report No. 1, 6:25191 (DOE/AF/92003—1)
Laser Spectroscopy
Picosecond spectroscopy of polar dye solutions at antistokes excitation, 6:25995 (UCRL-Trans—11679)
Production
Farm and cooperative alcohol plant study: technical and economic assessment as a commercial venture, 6:25195 (PB—81-112641)
US Department of Energy midwest appropriate technology small grants program. Semi-annual technical progress report, 6:25193 (DOE/R5/10217—1)

ETHANOL FUELS
Performance
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))

ETHANOL PLANTS
Geothermal Process Heat
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw, 6:25406 (DOE/ID/12051—T1)

ETHERS
See also PHENYL ETHER
Chemical Reactions
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877
NMR Spectra
Separation and characterization of lignite derived preasphaltenes by gel permeation chromatography and nuclear magnetic resonance spectrometry, 6:24914

ETHINE
See ACETYLENE

ETHNIC GROUPS
See MINORITY GROUPS

ETHYLALDEHYDE
See ACETALDEHYDE
ETHYLENE
Chemical Reactions
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines. Progress report, August 16, 1980-April 30, 1981, 6:25996 (DOE/ER/03416—21)
ETHYNE
See ACETYLENE
EUROPIUM SULFIDES
Electric Conductivity
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Electronic Structure
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Superconductivity
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
EUTROPHICATION
Biological Effects
Limitations on the use of microcosms for predicting algal response to nutrient enrichment in lotic systems, 6:26239
EVAPORATORS
Performance
Measured performance of falling-jet flash evaporators, 6:25320 (SERI/TP—631-1270)
EXHAUST GASES
Chemical Composition
Informational report: 1979 progress of the chemical characterization panel of the composition of diesel exhaust project and results of particulate extraction round-robin, 6:26158 (PB—81-114670)
Corrosive Effects
Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report, 6:25443 (EPRI-CS—1845)
Energy Recovery
Oxygen-converter gas recovery, 6:25770 (CONF-800272—)
Environmental Impacts
Impact of aircraft emissions on air quality in the vicinity of airports. Volume I. Recent airport measurement programs, data analyses, and sub-model development. Final report Jan78-Jul 80, 6:26109 (AD—A-089962)
Heat Recovery
Ceramic heat-recovery systems for high-temperature furnaces, 6:25769 (CONF-800272—)
Hot Gas Cleanup
Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)
Odor
Physical and chemical phenomena responsible for odor formation in diesel engines. Interim progress report Jul 78-Dec 79, 6:25874 (PB—81-119166)
EXPERIMENTAL BREEDER REACTOR-2
See EBR-2 REACTOR
EXPLOSIONS
See also CRATERING EXPLOSIONS
NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
Air Pollution
Method for estimating the challenge to an air-cleaning system resulting from an accidental explosive event, 6:25166 (CONF-801038—23)
EXPLOSIVE FRACTURING
Mathematical Models
Calculations of cratering experiments with the bedded crack model, 6:25080 (LA-UR—81-1659)
Sandia technology, Volume 5, No. 4, 6:26620 (SAND—81-1065)
EXPONENTIAL PILES
See SUBCRITICAL ASSEMBLIES
EXTENSOMETERS
Ultrasonic extensometry for determining bolt preload in heavy industry: from petrochemical to reactors, 6:26028

F

F-2030 RESONANCES
Multiple Production
Observation of charmed F^+ meson produced by neutrino interaction in emulsion, 6:26504
FABRIC FILTERS
Performance Testing
Evaluation of ceramic fiber filters for hot gas cleanup in pressurized fluidized-bed combustion power plants, 6:25444 (EPRI-CS—1846)
FACILITIES (ACCELERATOR)
See ACCELERATOR FACILITIES
FACILITIES (EDUCATIONAL)
See EDUCATIONAL FACILITIES
FACILITIES (ENERGY)
See ENERGY FACILITIES
FACILITIES (NUCLEAR)
See NUCLEAR FACILITIES
FACILITIES (RESOURCE RECOVERY)
See RESOURCE RECOVERY FACILITIES
FACILITIES (TEST)
See TEST FACILITIES
FARADAY GENERATORS
See MHD GENERATORS
FAST BREEDER BLANKET FACILITY (FBBF)
See SUBCRITICAL ASSEMBLIES
FAST BREEDER TYPE REACTORS
See FBR TYPE REACTORS
FAST FLUX TEST FACILITY REACTOR
See FFTF REACTOR
FASTENERS
Static Loads
Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space, 6:25381
Ultrasonic extensometry for determining bolt preload in heavy industry: from petrochemical to reactors, 6:26028
FATTY ACIDS
See CARBOXYLIC ACIDS
FBR TYPE REACTORS
See also GCFR TYPE REACTORS
LMFBR TYPE REACTORS
Breeding Blankets
Fast Breeder Blanket Facility (FBBF). Annual report, January 1, 1980-December 31, 1980 (Gamma heating; neutron spectra), 6:25497 (PNE—81-149)
FEDERAL BUILDINGS
Solar Energy
Survey of EPA facilities for solar thermal energy applications. Final report 1 Nov 77-30 Jun 78, 6:25643 (PB—81-109316)
FEDERAL REPUBLIC OF GERMANY
Air Pollution
Relationship between relief and deposition of some organic and inorganic contaminants in snow of northern Bavaria, F.R.G., 6:26131 (CONF-800365—)
Energy Consumption
Economic and technical facts and developments in the field of energy in German industry, 6:25715 (CONF-7910214—)
Energy Demand
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
FEDERAL TEST PROCEDURE
Evaluation
The effects on measured emissions of a modified FTP (Federal Test Procedure) driving cycle. Technical report, 6:25884 (PB—81-103350)
FEED MATERIALS PLANTS
See also FUEL CYCLE CENTERS
Mill Tailings
Engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26197 (DOE/UMT—0102)
Summary of the engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26198 (DOE/UMT—0102S)

FERMILAB ACCELERATOR
Antiproton Beams
Final beam emittances at the end of anti P-accumulation for the Fermilab anti P source, 6:26075 (DOE/CH/03000—T3)
Electron Cooling
Final beam emittances at the end of anti P-accumulation for the Fermilab anti P source, 6:26075 (DOE/CH/03000—T3)
FERRATES
See IRON OXIDES
FERTILE MATERIALS
(Materials containing nuclides capable of being transformed into fissile nuclides by neutron capture.)
Neutron Reactions
Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions, 6:26598 (CONF-810606—68)
FERTILIZERS
Production
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)
FFTF REACTOR
Air Cleaning Systems
FFTF-containment air-cleaning system, 6:25509 (HEDL-SA—2105-FP)
Containment Systems
FFTF-containment air-cleaning system, 6:25509 (HEDL-SA—2105-FP)
Fuel Pins
Secure automated fabrication: remote fabrication of breeder-reactor fuel, 6:25099 (HEDL-SA—2332-FP)
Reactor Cores
Thermal hydraulic analysis of the FFTF core usng SUPERENERGY-2, 6:25510 (HEDL-SA—2194)
Remote Handling Equipment
Cropped-Pin Transfer System for the Fuels and Materials Examination Facility, 6:25511 (HEDL-SA—2300)
Spent Fuel Casks
Cropped-Pin Transfer System for the Fuels and Materials Examination Facility, 6:25511 (HEDL-SA—2300)
Effectiveness of criticality safety technology, 6:25513 (HEDL-SA—2373-FP)
Spent Fuel Storage
Effectiveness of criticality safety technology, 6:25513 (HEDL-SA—2373-FP)
Thermal hydraulics of handling FFTF fuel in sodium and argon, comparing test results with calculated, 6:25494 (HEDL-SA—2203-FP)
Test Facilities
Hot-cell verification facility, 6:25512 (HEDL-SA—2316-FP)
Transients
Differential sensitivity theory applied to movement of maxima responses, 6:25520 (CONF-810606—42)
FIBERGLASS
Light Transmission
Light transmission measurements through glass fiber insulations, 6:25688
Performance Testing
Interlaboratory comparison of the ASTM C 335 pipe insulation test, 6:25759
Thermal Conductivity
Fibrous insulating materials as standard reference materials at low temperatures, 6:25679
Interlaboratory comparison of the ASTM C 335 pipe insulation test, 6:25759
Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations, 6:25687
Light transmission measurements through glass fiber insulations, 6:25688
FIELD THEORIES
Decoupling
Decoupling theorems and effective field theories, 6:26542
FILMS
(Not for PHOTOGRAPHIC FILMS or NUCLEAR EMULSIONS.)
See also SUPERCONDUCTING FILMS
Thermal Diffusivity
Method for fast pulsed thermal diffusivity measurements in thin films, 6:26614 (SAND—80-2694C)
FIRE STATIONS
See PUBLIC BUILDINGS
FIREDAMP
See METHANE
FIRST WALL
Design
First-wall, blanket, and shield engineering test program for magnetically confined fusion power reactors, 6:26684 (CONF-801011—100)
Functional requirements for fusion reactor first walls. Status report No. MITNRL-002, 6:26692 (DOE/ER/10107—2)
Eddy Currents
Electromagnetic effects involving a tokamak reactor first wall and blanket, 6:26676 (CONF-801011—91)
FISCHER-TROPSCH SYNTHESIS
Catalysts
Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal, 6:24892
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)
Chemical Reaction Kinetics
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)
FISH CULTURE
See AQUACULTURE
FISH PRODUCTS
See SEAFOOD
FISHES
See also SALMON
TROUT
Baseline Ecology
Tongue River in Wyoming: a baseline fisheries assessment, Monarch to the state line, 6:26297 (ANL/LRP—10)
Biological Stress
Effects of sublethal entrainment stresses on the vulnerability of juvenile bluegill sunfish to predation, 6:25462 (ORNL/TM—7801)
Contamination
Role of clouds in atmospheric transport of mercury and other pollutants: 1. The link between acid precipitation, poorly buffered waters, mercury and fish. 2. The role of cloud water in atmospheric transport, 6:26133 (CONF-800365—)
Entrainment
Cooling water intake screening devices used to reduce entrainment and impingement. Topical briefs: fish and wildlife resources and electric power generation, No. 9, 6:25468 (PB—81-116055)
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)
Impingement
Assessment of the impacts of water intakes on alewife, rainbow smelt, and yellow perch populations in Lake Michigan (Alewife; smelt; perch), 6:26296 (ANL/ES—109)
Cooling water intake screening devices used to reduce entrainment and impingement. Topical briefs: fish and wildlife resources and electric power generation, No. 9, 6:25468 (PB—81-116055)
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)
Mortality
Fishkills in two moderately acid lakes due to high aluminum concentration, 6:26370 (CONF-800365—)
Population Dynamics
Assessment of the impacts of water intakes on alewife, rainbow smelt, and yellow perch populations in Lake Michigan (Alewife; smelt; perch), 6:26296 (ANL/ES—109)
Effects of elevated temperatures on macroinvertebrate populations in the Browns Ferry experimental ecosystems, 6:26329
Fish and freshwater chemistry, 6:26359 (CONF-800365—)

Historical land-use changes related to fish status development in different areas of southern Norway, 6:26201 (CONF-800365—)
Lake acidification, fish damage, and utilization of outfields. A comparative survey of six highland areas, southeastern Norway, 6:26386 (CONF-800365—)
Literature review: response of fish to thermal discharges. Final report, 6:26323 (EPRI-EA—1840)
Loss of fish populations in Southern Norway. Dynamics and magnitude of the problem, 6:26385 (CONF-800365—)
Studies on freshwater fish populations: effects of acidification on reproduction, population structure, growth and food selection, 6:26381 (CONF-800365—)
Widespread and diverse changes in the biota of North American lakes and rivers coincident with acidification, 6:26340 (CONF-800365—)

Predator-Prey Interactions
Effects of sublethal entrainment stresses on the vulnerability of juvenile bluegill sunfish to predation, 6:25462 (ORNL/TM—7801)

Reproduction
Effects of temperature on bluegill reproduction and young-of-the-year standing stocks in experimental ecosystems, 6:26330
Fallout, distribution and some effects of Zn, Cd, Pb, Cu and As in aquatic ecosystems near a base metal smelter on Canada's Precambrian Shield, 6:26366 (CONF-800365—)
Studies on freshwater fish populations: effects of acidification on reproduction, population structure, growth and food selection, 6:26381 (CONF-800365—)

Sensitivity
Aluminum toxicity to fish as related to acid precipitation and Adirondack surface water quality, 6:26361 (CONF-800365—)
River Hoegvadsan liming project: a presentation, 6:26365 (CONF-800365—)

Tolerance
Fish in naturally acidic lakes of northern Wisconsin, USA, 6:26380 (CONF-800365—)

FISSILE MATERIALS
(Materials containing nuclides capable of undergoing fission by interaction with slow neutrons.)

Neutron Reactions
Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions, 6:26598 (CONF-810606—68)

FISSION

Nuclear Models
Equilibrium statistical treatment of angular momenta associated with collective modes in fission and heavy-ion reactions, 6:26604

FISSIONABLE MATERIALS
(Materials containing nuclides capable of undergoing fission by any process.)
See also FERTILE MATERIALS
FISSILE MATERIALS

Criticality
MORSE-C: a CDC-7600 program designed to solve nuclear criticality problems by using the Monte-Carlo method, 6:26025 (UCID—18993)

FISSIONABLE MATERIALS MANAGEMENT
See NUCLEAR MATERIALS MANAGEMENT

FISSURED FORMATIONS
See FRACTURED RESERVOIRS

FLAME PROPAGATION
Flame propagation in gaseous fuel mixtures in semiconfined geometries, 6:25079 (UCID—19000)

FLAT PLATE COLLECTORS

Computerized Simulation
Continuous-System-Modeling Program III: simulation of a solar collector under stagnation conditions, 6:25379 (CONF-800804—39)

Stagnation
Continuous-System-Modeling Program III: simulation of a solar collector under stagnation conditions, 6:25379 (CONF-800804—39)

Thermal Efficiency
Solar-energy-system performance evaluation: Dallas Recreation Center, Dallas, Texas. March-November 1980, 6:25352 (SOLAR/2038—81/14)

FLAWS
See DEFECTS

FLORIDA

Acid Rain
Acid precipitation in Florida (USA): results of a statewide monitoring network, 6:26125 (CONF-800365—)

Resource Recovery Facilities
Advantages of the hydrasposal process as applied to the Hempstead Resources Recovery Plant and the Dade County Solid Waste Recovery Plant, 6:25830 (ANL/CNSV-TM—60)

Wind Power
Techniques for assessing the wind energy resource in the Southeast region, 6:25416 (PNL—3669)

FLOW (BLOOD)
See BLOOD FLOW

FLOW MODELS

Finite Difference Method
Fracture flow modeling for low-level nuclear waste disposal, 6:25114 (CONF-801217—)

Finite Element Method
Computer simulation of groundwater flow at a commercial radioactive-waste landfill near West Valley, Cattaraugus County, New York, 6:25116 (CONF-801217—)
Fracture flow modeling for low-level nuclear waste disposal, 6:25114 (CONF-801217—)

Two-Dimensional Calculations
Computer simulation of groundwater flow at a commercial radioactive-waste landfill near West Valley, Cattaraugus County, New York, 6:25116 (CONF-801217—)

FLOWMETERS

Operation
Ten years with turbine metering, 6:26030

Performance
Ten years with turbine metering, 6:26030

FLUE GAS

Desulfurization
Coal Technology '80. Volume 3. Storage and handling. Volume 4. Direct combustion, 6:24949
Cyclic reheat for FGD: status report. Final report, 6:25454 (EPRI-CS—1843)
Evaluation of 10-MW Shawnee cocurrent scrubber. Final report, 6:25453 (EPRI-CS—1806)
Evaluation of chemical coal cleaning processes, 6:24954
Flue gas desulfurization pilot study: summary of phase I and phase II reports, 6:25470 (PB—81-119422)
Proceedings: symposium on flue-gas desulfurization, 6:24926 (EPA/600/9—81-019B)

Energy Recovery
Ceramic recuperators for industrial flue-gas energy recovery, 6:25775 (CONF-800272—)

Monitoring
CEGB experience with additive trials, 6:25063 (EPRI-WS—80-127)

FLUID MECHANICS

Differential Equations
Adaptive-mesh zoning by the equipotential method, 6:26627 (UCID—19062)

FLUIDIZED-BED COMBUSTION

Commercialization
Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal, 6:24892

Economics
Methods of improving limestone utilization in FBC, 6:24955 (CONF-800806—44)

Marketing Research
Impact of New Source Performance Standards on advanced industrial energy technology, 6:25604 (CONF-801210—25)

Meetings
Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal, 6:24892

FLUIDIZED-BED COMBUSTORS

Combustion Products
Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report, 6:25443 (EPRI-CS—1845)

Demonstration Programs
Industrial application of fluidized-bed combustion. Quarterly technical progress report, October-December, 1980, 6:26060 (DOE/ET/10381—150)
Design
Circulating fluidized bed boiler, 6:24967
Exhaust-fired fluid-bed combined cycle for power generation: preliminary feasibility study. Final report, 6:25442 (EPRI-CS—1818)
Desulfurization
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
Exhaust Gases
Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)
Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report, 6:25443 (EPRI-CS—1845)
Hot Gas Cleanup
Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
Evaluation of ceramic fiber filters for hot gas cleanup in pressurized fluidized-bed combustion power plants, 6:25444 (EPRI-CS—1846)
Operation
Industrial application of fluidized-bed combustion. Quarterly technical progress report, October-December, 1980, 6:26060 (DOE/ET/10381—150)
Performance
Industrial application of fluidized-bed combustion. Quarterly technical progress report, October-December, 1980, 6:26060 (DOE/ET/10381—150)
Performance Testing
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
Pilot Plants
Energy recovery from municipal solid waste and sewage sludge using multisolid fluidized-bed combustion technology, 6:25205

FLUORIDES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977
Removal
Removal of fluoride from aqueous nitric acid, 6:25100 (ORNL/TM—7502)

FLUORINATED ALIPHATIC HYDROCARBONS
See also FLUOROFORM
Chemical Reactions
Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909

FLUORINE 19
Nuclear Magnetic Resonance
Development and application of analytical techniques to chemistry of donor solvent liquefaction. Quarterly progress report, April 1980-June 1980, 6:25968 (DOE/PC/30041—T2)

FLUORINE 19 TARGET
Deuteron Reactions
Beta-ray branching in the decay of ^{20}F, 6:26580

FLUORINE 20
Beta-Minus Decay
Beta-ray branching in the decay of ^{20}F, 6:26580

FLUORINE COMPOUNDS
Shubnikov-De Haas Effect
Magnetic quantum oscillations in tetramethyltetraselenafulvalene-hexafluorophosphate $[(TMTSF)_2PF_6]$, 6:25959

FLUOROFORM
Vapor Pressure
$^{12}C/^{13}C$ and H/D vapor pressure isotope effects of fluoroform: intermolecular interactions in liquid fluoroform, 6:26452 (DOE/ER/10612—3)

FLY ASH
Air Pollution Control
A manual for the use of electrostatic precipitators to collect fly ash particles. Final report Dec 78-Feb 80, 6:25467 (PB—81-112757)
Chemical Composition
Crystallized fly-ash feasibility study. Final report, 6:25802 (EPRI-EL—1836)
Crystallization
Crystallized fly-ash feasibility study. Final report, 6:25802 (EPRI-EL—1836)
Electric Conductivity
Fly-ash conditioning: status and findings of EPRI program, 6:25456 (EPRI-WS—80-127)
Summary of discussion-group sessions on fly ash conditioning: coal firing, 6:25457 (EPRI-WS—80-127)
Electrical Properties
Crystallized fly-ash feasibility study. Final report, 6:25802 (EPRI-EL—1836)
Environmental Effects
Effect of calcium on the toxicity of zinc and lead compounds in the water medium, 6:26362 (CONF-800365—)
Environmental Impacts
Assessment of the environmental impact of power plant fly ash, 6:24933 (IS-M—309)
Materials Recovery
Recovery of aluminum and other metal values from fly ash (Patent), 6:24932
Mechanical Properties
Crystallized fly-ash feasibility study. Final report, 6:25802 (EPRI-EL—1836)
Recycling
Crystallized fly-ash feasibility study. Final report, 6:25802 (EPRI-EL—1836)
Recovery of aluminum and other metal values from fly ash (Patent), 6:24932
Separation Processes
Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980, 6:24929 (IS—4773)
Uses
Microcosm evaluation of the agricultural potential of fly-ash-amended soils, 6:26203
Waste Disposal
Evaluation of potential impacts to the utility sector for compliance with RCRA, 6:25840 (EPA/600/9—81-019B)
Potential effects on groundwater of fly ash and FGD waste disposal in lignite surface mine pits in North Dakota, 6:24927 (EPA/600/9—81-019B)
Waste Management
Assessment of the environmental impact of power plant fly ash, 6:24933 (IS-M—309)
Waste Processing
Recovery of aluminum and other metal values from fly ash (Patent), 6:24932
Waste Product Utilization
Government procurement of cement and concrete containing fly ash, 6:24928 (EPA/600/9—81-019B)
Potential effects on groundwater of fly ash and FGD waste disposal in lignite surface mine pits in North Dakota, 6:24927 (EPA/600/9—81-019B)
Proceedings: symposium on flue-gas desulfurization, 6:24926 (EPA/600/9—81-019B)

FLYWHEEL ENERGY STORAGE
Evaluation
Testing and evaluation of a solar photovoltaic flywheel energy storage system, 6:25578 (DOE/ET/20279—130)
Testing
Testing and evaluation of a solar photovoltaic flywheel energy storage system, 6:25578 (DOE/ET/20279—130)

FLYWHEEL-POWERED VEHICLES
Flywheels
Composite flywheel balance experience, 6:25883 (Y/DX—290)
Stability
Composite flywheel balance experience, 6:25883 (Y/DX—290)
FLYWHEELS
Bearings
NTEV flywheel bearing integrity test, 6:25882 (DOE/CS/51213—T6)
Composite Materials
Study of flywheel energy storage system for electric utilities, 6:25577 (CONF-790203—)
Design
Study of flywheel energy storage system for electric utilities, 6:25577 (CONF-790203—)
Fabrication
Study of flywheel energy storage system for electric utilities, 6:25577 (CONF-790203—)
Performance Testing
Composite flywheel balance experience, 6:25883 (Y/DX—290)
FOILS
Superconductivity
Vortex unbinding in superconducting thin films, 6:26618 (CONF-800561—4)
FOOD
See also FRUITS
MILK
SEAFOOD
Drying
Foreign travel report (Needs), 6:25323 (CONF-790203—)
Refrigeration
Foreign travel report (Needs), 6:25323 (CONF-790203—)
FOOD CHAINS
Contamination
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
Sensitivity
pH level and food organisms for fish: studies of 1000 lakes in Norway, 6:26376 (CONF-800365—)
FOOD INDUSTRY
See also DAIRY INDUSTRY
MEAT INDUSTRY
Energy Audits
Energy conservation in the canning industry, 6:25814
Energy Consumption
Energy reduction in beet sugar processing by cossette liming, 6:25817
Energy requirements and equipment for continuous processing of raw foods by gas-exchange, 6:25818
Heat recovery/thermal energy storage for energy conservation in food processing, 6:25816
Heat Recovery
Heat recovery/thermal energy storage for energy conservation in food processing, 6:25816
Heat Storage
Industrial thermal-storage applications, 6:25765 (CONF-800272—)
Solar Process Heat
Solar production of intermediate-temperature process heat, phase I design. Preliminary design report, 6:25332 (DOE/CS/30311—T2)
Waste Heat Utilization
Heat recovery/thermal energy storage for energy conservation in food processing, 6:25816
Waste Product Utilization
Evaluation of potential food applications of dried distillers spent grain (DSG). Final research report, 6:25798 (DOE/CS/40352—T1)
FOOD PROCESSING
Design
Energy requirements and equipment for continuous processing of raw foods by gas-exchange, 6:25818
Energy Analysis
ALINET: a model for assessing energy conservation opportunities in food processing, 6:25815
Evaporation
Use of solar concentrated brines for food processing, 6:25358
Lyophilization
Use of solar concentrated brines for food processing, 6:25358
Mathematical Models
ALINET: a model for assessing energy conservation opportunities in food processing, 6:25815
Meetings
Agricultural energy. Volume 3. Food processing, 6:25812
FORAGE
Contamination
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
FORCED CONVECTION
Finite Element Method
Calculational method for combined natural circulation and forced-convection flow in a channel (LMFBR), 6:25518 (CONF-800723—26)
FORCED DRAFT COOLING TOWERS
See MECHANICAL DRAFT COOLING TOWERS
FORESTS
Acid Rain
Acid precipitation, throughfall chemistry and canopy processes, 6:26189 (CONF-800365—)
Acidification
Acid precipitation, plant nutrients and forest growth, 6:26337 (CONF-800365—)
Effects of artificial acidification with sulfuric acid on tree growth in Scots pine forest, 6:26349 (CONF-800365—)
Effects of acid precipitation on soil and forest. 1. Methods of the field experiments, 6:26350 (CONF-800365—)
Biogeochemistry
Impact of acid precipitation on forest canopies and soils in the northeastern US, 6:26343 (CONF-800365—)
Energy Source Development
Forest biomass for energy: a perspective, 6:25281
Eutrophication
Acid precipitation, plant nutrients and forest growth, 6:26337 (CONF-800365—)
Plant Growth
Response of a forest ecotone to ionizing radiation. Progress report, October 15, 1980-October 14, 1981, 6:26315 (DOE/EV/02283—2)
Soil Chemistry
Effects of artificial acidification with sulfuric acid on soil chemistry in a Scots pine forest, 6:26186 (CONF-800365—)
Spatial Distribution
Quantitative analysis of forest island pattern in selected Ohio landscapes, 6:26176 (ORNL/TM—7759)
Species Diversity
Reconstruction of species composition of stands as a necessary condition for the survival of the Niepolomice Forest (Poland), 6:26344 (CONF-800365—)
FORMATES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977
FORMIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908
FOSSIL-FUEL POWER PLANTS
See also ELECTRIC UTILITIES
Aesthetics
Prediction of socio-economic impacts by the proposed unit No. 9 at Vienna and alternative sites, 6:25448 (PB—81-110256)
Air Pollution Control
An evaluation of air pollution abatement relaxation strategies for Tennessee during periods of pending or actual energy emergencies. (Tennessee State science, engineering, and technology project). Final report, 6:25605 (PB—81-114605)
Fly-ash conditioning: status and findings of EPRI program, 6:25456 (EPRI-WS—80-127)
Ashes
Evaluation of potential impacts to the utility sector for compliance with RCRA, 6:25840 (EPA/600/9—81-019B)
Economic Impact
Prediction of socio-economic impacts by the proposed unit No. 9 at Vienna and alternative sites, 6:25448 (PB—81-110256)

Electrostatic Precipitators
A manual for the use of electrostatic precipitators to collect fly ash particles. Final report Dec 78-Feb 80, 6:25467 (PB—81-112757)
Environmental Impacts
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Assessment of the environmental impact of power plant fly ash, 6:24933 (IS-M—309)
Phytoplankton studies and nutrient concentrations in the vicinity of the C. P. Crane Generating Station. Final report Jul 79 to Mar 80, 6:26325 (PB—81-114746)
Flue Gas
Applications of fireside additives to utility boilers: workshop proceedings, 6:24958 (EPRI-WS—80-127)
Cyclic reheat for FGD: status report. Final report, 6:25454 (EPRI-CS—1843)
Evaluation of 10-MW Shawnee cocurrent scrubber. Final report, 6:25453 (EPRI-CS—1806)
Flue gas desulfurization pilot study: summary of phase I and phase II reports, 6:25470 (PB—81-119422)
Summary of special discussion group on acid plumes and fallout, 6:25458 (EPRI-WS—80-127)
Fluidized-Bed Combustors
Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
Evaluation of ceramic fiber filters for hot gas cleanup in pressurized fluidized-bed combustion power plants, 6:25444 (EPRI-CS—1846)
Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report, 6:25443 (EPRI-CS—1845)
Fly Ash
Evaluation of potential impacts to the utility sector for compliance with RCRA, 6:25840 (EPA/600/9—81-019B)
Fuel Consumption
Cost and quality of fuels for electric utility plants: Energy data report. 1980 annual, 6:25632 (DOE/EIA—0191(80))
Gas Turbines
Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report, 6:25443 (EPRI-CS—1845)
Health Hazards
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Hot Gas Cleanup
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
Maintenance
A manual for the use of electrostatic precipitators to collect fly ash particles. Final report Dec 78-Feb 80, 6:25467 (PB—81-112757)
Operation
A manual for the use of electrostatic precipitators to collect fly ash particles. Final report Dec 78-Feb 80, 6:25467 (PB—81-112757)
Residual Fuels
Use of fuel additives in oil firing, 6:25061 (EPRI-WS—80-127)
Retrofitting
Economic and environmental tradeoffs in coal conversion, 6:25638 (CONF-800608—8)
Site Surveys
Land use and development trends in Dorchester and Wicomico counties, 6:25464 (PB—81-110249)
Social Impact
Prediction of socio-economic impacts by the proposed unit No. 9 at Vienna and alternative sites, 6:25448 (PB—81-110256)
Systems Analysis
Economic and environmental tradeoffs in coal conversion, 6:25638 (CONF-800608—8)
Waste Heat Utilization
Cyclic reheat for FGD: status report. Final report, 6:25454 (EPRI-CS—1843)

FRACER-FULCO METHOD
See DISPERSION RELATIONS
FRACTURED RESERVOIRS
Multiphase Flow
Characterization of fluid flow in naturally fractured reservoirs, 6:24990 (DOE/BETC/IC—80/3(Vol.1))
FRANCE
Energy Conservation
Analysis of French investments in energy conservation technologies since 1974 and economic actions undertaken by the French government, 6:25782 (CONF-800272—)
Energy conservation in French industry and at Rhone-Poulenc, 6:25794 (CONF-7910214—)
Energy savings: a competitive hedge, 6:25673 (CONF-800272—)
French industry and the energy conservation challenge, 6:25789 (CONF-7910214—)
Energy Policy
French industry and the energy conservation challenge, 6:25789 (CONF-7910214—)
FREE CONVECTION
See NATURAL CONVECTION
FREE ELECTRON LASERS
Absolute Instabilities
Particle simulations of a finite-length free electron laser, 6:26038
Convective Instabilities
Particle simulations of a finite-length free electron laser, 6:26038
Design
Theoretical investigation of a 10-μm free-electron laser amplifier using a 50-MeV multi-kA electron beam, 6:26033 (UCRL—85653)
Efficiency
Particle simulations of a finite-length free electron laser, 6:26038
Simulation
Particle simulations of a finite-length free electron laser, 6:26038
FREEZERS
Directories
Energy-efficiency directory of refrigerators and refrigerator-freezers, 6:25719 (DOE/CS/20315—T11)
Operating Cost
Energy-efficiency directory of refrigerators and refrigerator-freezers, 6:25719 (DOE/CS/20315—T11)
Specifications
Energy-efficiency directory of refrigerators and refrigerator-freezers, 6:25719 (DOE/CS/20315—T11)
FRESH WATER
Acidification
Acidification of freshwaters: a large scale titration, 6:26248 (CONF-800365—)
Acidification of freshwater: sources and mechanisms, 6:26284 (CONF-800365—)
Aluminum toxicity to fish as related to acid precipitation and Adirondack surface water quality, 6:26361 (CONF-800365—)
Water Chemistry
Fish and freshwater chemistry, 6:26359 (CONF-800365—)
FRESH WATER ECOSYSTEMS
See AQUATIC ECOSYSTEMS
FRUITS
(Edible parts of plants only.)
Solar Drying
Solid desiccant regeneration by direct solar energy for fresh fruit drying, 6:25357
FTR REACTOR
See FFTF REACTOR
FUEL ADDITIVES
Economics
Retard back-end corrosion and acid emissions in oil-fired boilers, 6:25446 (EPRI-WS—80-127)
Evaluation
Engine tests using high-sulfur diesel fuel. Final report, 6:25851 (AD—A-090142)

Performance
Summary of the discussion-group sessions on high-temperature corrosion and fouling in oil-fired boilers, 6:25064 (EPRI-WS—80-127)
Performance Testing
Planning and executing fireside additive testing in Ontario Hydro, 6:24961 (EPRI-WS—80-127)

FUEL ASSEMBLIES
Heat Transfer
Two-dimensional computational modeling of sodium boiling in simulated LMFBR fuel-pin bundles, 6:25521 (CONF-810606—54)
Hydraulics
Two-dimensional computational modeling of sodium boiling in simulated LMFBR fuel-pin bundles, 6:25521 (CONF-810606—54)

FUEL CELL POWER PLANTS
Coal Gasification
Development of molten carbonate fuel-cell power plant. Quarterly technical progress report, August 1, 1980-October 31, 1980, 6:25665 (DOE/ET/17019—3)
Design
Development of molten carbonate fuel-cell power plant. Quarterly technical progress report, August 1, 1980-October 31, 1980, 6:25665 (DOE/ET/17019—3)

FUEL CELLS
See also ACID ELECTROLYTE FUEL CELLS
AMMONIA FUEL CELLS
HYDROCARBON FUEL CELLS
HYDROGEN FUEL CELLS
MOLTEN CARBONATE FUEL CELLS
REDOX FUEL CELLS
Commercialization
Fuel-cell case study. Final report, 6:25663 (DOE/CS/20215—T1)

FUEL CONSUMPTION
Data
Cost and quality of fuels for electric utility plants: Energy data report. 1980 annual, 6:25632 (DOE/EIA—0191(80))

FUEL COOLING INSTALLATIONS
See SPENT FUEL STORAGE

FUEL CYCLE
See also FUEL MANAGEMENT
Meetings
Atomic Industrial Forum, Inc. fuel cycle conference, 1979, 6:25103
Optimization
Resource consequences of reenrichment versus blending, 6:25500 (HEDL-SA—2322-FP)
Risk Assessment
INFCE past midcourse, 6:25615

FUEL CYCLE CENTERS
Accidents
Method for estimating the challenge to an air-cleaning system resulting from an accidental explosive event, 6:25166 (CONF-801038—23)

FUEL ECONOMY
Furnaces
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)
Information
Impact of fuel-economy information on new-car and light-truck buyers, 6:25754 (DOE/CS/58840—T1)

FUEL ELEMENT FAILURE
Breached-pin testing in the US (LMFBR), 6:25495 (HEDL-SA—2405-FP)

FUEL ELEMENTS
See also FUEL PLATES
NUCLEAR FUELS
Antineutrinos
Reactor antineutrino spectra and their application to antineutrino-induced reactions II, 6:25501 (HEDL-SA—2303-FP)
Electron Spectra
Reactor antineutrino spectra and their application to antineutrino-induced reactions II, 6:25501 (HEDL-SA—2303-FP)
Stress Analysis
Accuracy of finite-element models for the stress analysis of multiple-holed moderator blocks, 6:25485 (GA-A—16234)

FUEL FABRICATION PLANTS
See also FUEL CYCLE CENTERS
Secure automated fabrication: remote fabrication of breeder-reactor fuel, 6:25099 (HEDL-SA—2332-FP)
Furnaces
Rhenium muffle tube fabricated by CVD for application in 1800°C high thermal efficiency fuel processing furnace, 6:25904 (HEDL-SA—2137)

FUEL GAS
See also HIGH BTU GAS
Calorific Value
Pricetown I underground coal gasification field test: operations report, 6:24869 (MLM-MU—81-62-0007)
Chemical Composition
Pricetown I underground coal gasification field test: operations report, 6:24869 (MLM-MU—81-62-0007)
Desulfurization
Fuel gas desulfurization (Patent), 6:25069

FUEL INJECTION SYSTEMS
Design
Effects of fuel-injector design on ultra-lean combustion performance, 6:25864 (DOE/NASA/51040—26)
Performance
Effects of fuel-injector design on ultra-lean combustion performance, 6:25864 (DOE/NASA/51040—26)

FUEL MANAGEMENT
Computer Calculations
Assessment of the prevailing physics codes: LEOPARD, LASER, and EPRI-CELL, 6:25502 (HEDL-SA—2323)

FUEL OILS
See also RESIDUAL FUELS
Biological Effects
Trophic interactions in experimental marine ecosystems perturbed by oil, 6:26396
Chemical Preparation
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)
Combustion
Applications of fireside additives to utility boilers: workshop proceedings, 6:24958 (EPRI-WS—80-127)
CEGB experience with additive trials, 6:25063 (EPRI-WS—80-127)
High-temperature corrosion and fouling in oil-fired power plants, 6:25062 (EPRI-WS—80-127)
Planning and executing fireside additive testing in Ontario Hydro, 6:24961 (EPRI-WS—80-127)
Retard back-end corrosion and acid emissions in oil-fired boilers, 6:25446 (EPRI-WS—80-127)
Summary of the discussion-group sessions on high-temperature corrosion and fouling in oil-fired boilers, 6:25064 (EPRI-WS—80-127)
Summary of discussion group sessions on back-end corrosion and acid emissions by oil-fired boilers, 6:25065 (EPRI-WS—80-127)
Fuel Additives
CEGB experience with additive trials, 6:25063 (EPRI-WS—80-127)
High-temperature corrosion and fouling in oil-fired power plants, 6:25062 (EPRI-WS—80-127)
Planning and executing fireside additive testing in Ontario Hydro, 6:24961 (EPRI-WS—80-127)
Retard back-end corrosion and acid emissions in oil-fired boilers, 6:25446 (EPRI-WS—80-127)
Summary of the discussion-group sessions on high-temperature corrosion and fouling in oil-fired boilers, 6:25064 (EPRI-WS—80-127)
Summary of discussion group sessions on back-end corrosion and acid emissions by oil-fired boilers, 6:25065 (EPRI-WS—80-127)
Synthesis
Conversion of atactic polypropylene waste to fuel oil, 6:25773 (CONF-800272—)

FUEL PLATES
Irradiation
Irradiation testing of miniature fuel plates for the RERTR program (Reduced Enrichment Research and Test Reactors), 6:25515 (ORNL/TM—7761)
FUEL REPROCESSING PLANTS
See also FUEL CYCLE CENTERS
WEST VALLEY PROCESSING PLANT
Containment Systems
Permeation cascades for the separation of krypton and xenon from nuclear reactor atmospheres, 6:25567
FUEL SLURRIES
Combustion
Direct firing of coal-water suspensions: state-of-the-art review, 6:24965
Demonstration Programs
Potential of colloidal fuels in future energy usage, 6:24966
Stabilization
Potential of colloidal fuels in future energy usage, 6:24966
FUEL SUBSTITUTION
Analysis of alternative-fuel price trajectories, 6:24969 (DOE/RG/10446—T1)
FUEL SUPPLIES
Forecasting
Long-range oil and gas supply methodology: proposed reformulation, 6:25626 (BNL—51359)
FUEL-COOLANT INTERACTIONS
Breached-pin testing in the US (LMFBR), 6:25495 (HEDL-SA—2405-FP)
FUMES
See AEROSOLS
FUNGICIDES
Biological Accumulation
Environmental destinies of insecticides, herbicides, and fungicides in the plants, animals, soil, air, and water of homologous microcosms, 6:26397
FURNACES
See also ARC FURNACES
Design
Development of a concentric-vortex agricultural-residue furnace, 6:25277
Integrated system for solid waste disposal with energy recovery and volumetric reduction by a new pyrolysis furnace, 6:25189
Retrofitting
Ceramic heat-recovery systems for high-temperature furnaces, 6:25769 (CONF-800272—)
Direct firing of coal-water suspensions: state-of-the-art review, 6:24965
Thermal Fatigue
W-Re composite tube fabricated by chemical vapor deposition for application in an 1800°C high thermal efficiency fuel-processing furnace, 6:25908
FUSION REACTORS
See THERMONUCLEAR REACTORS

G

GADOLINIUM 146
Energy Levels
Nuclei far from stability using exotic targets, 6:26589 (LA-UR—81-1593)
GADOLINIUM 148 TARGET
Proton Reactions
Nuclei far from stability using exotic targets, 6:26589 (LA-UR—81-1593)
GADOLINIUM 150
Giant Resonance
Observation of giant dipole resonances built on states of high energy and spin, 6:26588
GADOLINIUM COMPOUNDS
Magnetic Properties
Materials for magnetic refrigeration between 2 and 20 K, 6:25949 (LA—8746-MS)
Thermal Conductivity
Materials for magnetic refrigeration between 2 and 20 K, 6:25949 (LA—8746-MS)
GAGES (STRAIN)
See STRAIN GAGES
GALLIUM 68
Positron Computed Tomography
In vivo quantitation of regional myocardial blood flow by positron-emission computed tomography (Dogs; ^{68}Ga; ^{141}Ce), 6:26309
GALLIUM ALLOYS
Crystallography
Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices, 6:25957
Electron Diffraction
Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices, 6:25957
GALLIUM ARSENIDES
Corrosion
Investigation of photoelectrochemical corrosion of semiconductors. Final report, 15 April 1980-15 April 1981, 6:25954 (SERI/TR—8002-6-T1)
Emission Spectra
Radiation-to-light converters for nuclear environments: near-infrared emitters, 6:26083 (UCRL—85604)
Epitaxy
Epitaxial regrowth of thin amorphous GaAs layers, 6:25956
Ion Channeling
Epitaxial regrowth of thin amorphous GaAs layers, 6:25956
Photoluminescence
New transitions in the photoluminescence of GaAs quantum wells, 6:25955
Recrystallization
Epitaxial regrowth of thin amorphous GaAs layers, 6:25956
GALLIUM COMPLEXES
Labelling
Tricatecholamide analogs of enterobactin as Ga and In radiopharmaceuticals, 6:26005
GAMMA DOSIMETRY
Lyoluminescence
Lyoluminescent dosimetric materials and their response to ionizing radiation, 6:26084
GAMMA RADIATION
Measuring Instruments
Initial neutron and gamma air-earth interface measurements. Final report, 6:26101 (AD—464381)
GAMMA SPECTROMETERS
Data Acquisition
Advanced mobile multi-processor gamma-ray acquisition and analysis system. Topical report, 6:26080 (NUREG/CR—1668)
Data Processing
Advanced mobile multi-processor gamma-ray acquisition and analysis system. Topical report, 6:26080 (NUREG/CR—1668)
GAMMA SPECTROSCOPY
Data Analysis
GRPAUT: a computer code for automated isotopic analysis of plutonium spectra, 6:26722 (MLM—2841(OP))
Data Processing
Portable computer to reduce gamma-ray spectra for plutonium isotopic ratios, 6:25174 (UCRL—53145)
GARRETT PROCESS
See OXY MODIFIED IN-SITU PROCESS
GAS COMPRESSORS
Bottoming Cycles
Pipeline bottoming-cycle study: operational reliability and maintainability assessment, 6:25075 (GESP—813)
Noise Pollution Abatement
Compressor station noise-abatement: a case study, 6:25074
GAS COOLANTS
See GASES
GAS COOLED FAST BREEDER REACTOR
See GCFR REACTOR
GAS COOLED FAST BREEDER REACTORS
See GCFR TYPE REACTORS
GAS ENGINES
See INTERNAL COMBUSTION ENGINES

GAS LASERS
Excitation
Effect of rare-gas diluents on the performance of an XeCl laser pumped by a high-intensity electron beam, 6:26034
Oscillations
16-μm laser oscillation in propyne, 6:26035
GAS METERS
Errors
Field method for determining pulsation in orifice meters, 6:25077
GAS SPILLS
Ignition
Initiation of detonation in unconfined natural gas-air clouds. Final report, 6:25071 (PB—81-113292)
Pollution Control
Study of gelled LNG, 6:25078 (DOE/TIC—11452)
GAS TURBINE ENGINES
Combustors
A three-dimensional model of spray evaporation in gas turbine combustors. Interim report, 6:25854 (AD—A-090337)
Demonstration Programs
Support services for the automotive-gas-turbine project, 6:25863 (DOE/NASA/0144—81/1)
Exhaust Gases
An automatic isokinetic sampler for particulate emissions from aircraft gas turbine engines. Final report Feb 75-Jun 78, 6:25852 (AD—A-090280)
USAF aircraft engine emission goals: a critical review. Final report Sep 78-Jun 79, 6:25853 (AD—A-090282)
Fuel Injection Systems
Effects of fuel-injector design on ultra-lean combustion performance, 6:25864 (DOE/NASA/51040—26)
Performance
Effects of fuel-injector design on ultra-lean combustion performance, 6:25864 (DOE/NASA/51040—26)
Performance Testing
Support services for the automotive-gas-turbine project, 6:25863 (DOE/NASA/0144—81/1)
Regenerators
Ceramic regenerator systems development program. Final report, 6:25862 (DOE/NASA/0008—12)
Rotors
The response of turbine engine rotors to interference rubs, 6:25855 (AD—A-090408)
Technology Assessment
Overview: DOE/NASA automotive gas turbine and Stirling projects, 6:25865 (DOE/NASA/51040—28)
GAS TURBINES
Combustors
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
Corrosion
Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report, 6:25443 (EPRI-CS—1845)
Erosion
Predictions of combustion turbine performance in pressurized fluidized-bed combustion power plants. Final report, 6:25443 (EPRI-CS—1845)
Failure Mode Analysis
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Fuel Substitution
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
Reliability
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Waste Heat
Pipeline bottoming-cycle study: technological feasibility of the bottoming cycle. Task IIIC report, 6:25823 (GESP—785)
GASEOUS WASTES
See also EXHAUST GASES
FLUE GAS
Waste Product Utilization
COthane, methane from waste CO. Final technical report, 6:25182 (DOE/CS/40177—T2)
GASES
See also AIR
EXHAUST GASES
FLUE GAS
FUEL GAS
HIGH BTU GAS
NATURAL GAS
PYROLYTIC GASES
SYNTHESIS GAS
Interfaces
Overview of current status of solid-gas interface science, 6:25239 (CONF-8006156—)
VII. Overview of current status of solid-gas interface science, 6:25979 (IS-M—316)
GASOHOL
Environmental Effects
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4))
Evaporation
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4))
Fuel Economy
Highway fuel economy of gasohol and unleaded gasoline, 6:25894
Performance
Gasohol: laboratory and fleet test evaluation, 6:25885 (DOE/BETC/IC—80/3(Vol.4))
Performance Testing
Fleet experience using three blends of ethanol and unleaded gasoline, 6:25197
Production
Gasohol by direct extraction of aqueous ferments. Interim progress report No. 1, 6:25191 (DOE/AF/92003—1)
GASOLINE
See also MOBIL M-GASOLINE PROCESS
UNLEADED GASOLINE
Antiknock Ratings
Composition and octane number of US motor gasolines sampled in the Du Pont 1979 summer road octane survey, 6:25891 (DOE/BETC/IC—80/3(Vol.4))
Chemical Analysis
Composition and octane number of US motor gasolines sampled in the Du Pont 1979 summer road octane survey, 6:25891 (DOE/BETC/IC—80/3(Vol.4))
Evaporation
Evaporative emissions from vehicles operating on methanol/gasoline blends, 6:25889 (DOE/BETC/IC—80/3(Vol.4))
Fleet trials using methanol/gasoline blends, 6:25890 (DOE/BETC/IC—80/3(Vol.4))
Performance
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))
Trade
Reducing the impact of margin ceilings on gasoline wholesalers. Final report, 6:25042 (PB—81-117160)
GASTEROPODS
See MOLLUSCS
GAUGE INVARIANCE
Symmetry Breaking
Suppression of superheavy magnetic monopoles in grand unified theories, 6:26546
GCFR REACTOR
Shielding
Final analysis of the GCFR exit shield integral experiment, 6:25496 (ORNL/TM—7839)
GCFR TYPE REACTORS
Reactor Control Systems
Application of a Self-Actuating Shutdown System (SASS) to a Gas-Cooled Fast Reactor (GCFR), 6:25504 (DOE/SF/01435—T1)
GE SEMICONDUCTOR DETECTORS
Multi-Channel Analyzers
Remote detection system, 6:26078 (LA—8814-MS)

GELS
Rheology
Study of gelled LNG, 6:25078 (DOE/TIC—11452)
Shear
Study of gelled LNG, 6:25078 (DOE/TIC—11452)
GENERATORS (ELECTRIC)
See ELECTRIC GENERATORS
GENERATORS (PULSE)
See PULSE GENERATORS
GENERATORS (STEAM)
See STEAM GENERATORS
GEOLOGIC FAULTS
Hazards
Ground rupture and seismic shaking as separate hazards of active faults (a study of active faulting in the Ojai Valley, Southern California), 6:26423
Risk Assessment
Estimating seismic hazards using past rupture patterns of faults near the eastern Snake River Plain, Idaho, 6:26424
Seismic Effects
Estimating seismic hazards using past rupture patterns of faults near the eastern Snake River Plain, Idaho, 6:26424
GEOLOGIC FISSURES
Hydrology
Analysis of pumping tests performed in a horizontal rectangular fracture, 6:26413 (LBL—12076)
Testing
Solute tracer tests in fractured media, 6:26411 (LBL—12076)
GEOLOGIC FORMATIONS
Hydrology
Some considerations for tracer tests in low permeability formations, 6:26408 (LBL—12076)
Permeability
Role of well testing in civil engineering, 6:26096 (LBL—12076)
GEORGIA
Wind Power
Techniques for assessing the wind energy resource in the Southeast region, 6:25416 (PNL—3669)
GEORGIA TECH. RESEARCH REACTOR
See GTRR REACTOR
GEOTHERMAL ENERGY
Directories
Montana Geothermal Handbook: a guide to agencies, regulations, permits and financial aids for geothermal development, 6:25392 (DOE/ID/12014—T1)
GEOTHERMAL ENERGY CONVERSION
Thermoelectric Generators
Thermoelectric energy converter for generation of electricity from low-grade heat (Patent), 6:25658
GEOTHERMAL FLUIDS
Corrosive Effects
Method for inhibiting silica precipitation and scaling in geothermal flow systems (Patent), 6:25398
Degassing
Multi-stage flash degaser (Patent), 6:25397
Desulfurization
Geothermal hydrogen sulfide removal, 6:25394 (DOE/ET/27203—1)
Scale Control
Method for inhibiting silica precipitation and scaling in geothermal flow systems (Patent), 6:25398
Water Pollution
Methodology to evaluate the potential for ground water contamination from geothermal fluid releases. Final report, 6:25395 (PB—81-111114)
GEOTHERMAL HEATING
Surveys
Geothermal policy project. Quarterly report, November 1, 1979-January 31, 1980, 6:25407 (DOE/SF/01795—T2)
GEOTHERMAL HEATING SYSTEMS
Design
Feasibility of geothermal heat use in the San Bernardino Municipal Wastewater Treatment Plant. Final report, September 1980-June 1981, 6:25408 (DOE/SF/11442—T1)
Economic Analysis
Feasibility of geothermal heat use in the San Bernardino Municipal Wastewater Treatment Plant. Final report, September 1980-June 1981, 6:25408 (DOE/SF/11442—T1)
GEOTHERMAL POWER PLANTS
Cooling Systems
Water-related constraints to the development of geothermal electric generating stations, 6:25396 (ORNL/TM—7718)
Decision Making
Geothermal well-field and power-plant investment-decision analysis, 6:25393 (DOE/ET/27242—T1)
Investment
Geothermal well-field and power-plant investment-decision analysis, 6:25393 (DOE/ET/27242—T1)
Water Requirements
Water-related constraints to the development of geothermal electric generating stations, 6:25396 (ORNL/TM—7718)
GEOTHERMAL PROCESS HEAT
Kelley Hot Spring Geothermal Project: Kelly Hot Spring Agricultural Center conceptual design, 6:25409 (GT—27041-4)
GEOTHERMAL SPACE HEATING
Kelley Hot Spring Geothermal Project: Kelly Hot Spring Agricultural Center conceptual design, 6:25409 (GT—27041-4)
GEOTHERMAL SYSTEMS
See also HOT-DRY-ROCK SYSTEMS
Fluid Injection
Thermal effects in welltests of fractured reservoirs, 6:25401 (LBL—12076)
GEOTHERMAL WELLS
Computer Codes
Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1, 6:25404 (SAND—80-7154/1)
Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description, 6:25405 (SAND—80-7154/2)
Cost
Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1, 6:25404 (SAND—80-7154/1)
Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description, 6:25405 (SAND—80-7154/2)
Decision Making
Geothermal well-field and power-plant investment-decision analysis, 6:25393 (DOE/ET/27242—T1)
Investment
Geothermal well-field and power-plant investment-decision analysis, 6:25393 (DOE/ET/27242—T1)
Mapping
Evaluation of equipment and methods to map lost circulation zones in geothermal wells, 6:25403 (SAND—80-7057)
Testing
Drawdown and build-up type curve for interference testing, 6:25402 (LBL—12076)
Well Drilling
Evaluation of equipment and methods to map lost circulation zones in geothermal wells, 6:25403 (SAND—80-7057)
Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1, 6:25404 (SAND—80-7154/1)
Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description, 6:25405 (SAND—80-7154/2)
GERMANES
Chemical Reactions
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines. Progress report, August 16, 1980-April 30, 1981, 6:25996 (DOE/ER/03416—21)
GERMANIUM 76 TARGET
Neon 20 Reactions
Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near N ~ 50, 6:26587
GERMANIUM BASE ALLOYS
Magnetization
Magnetization density in paramagnetic UGe_3, 6:25962
Neutron Diffraction
Magnetization density in paramagnetic UGe_3, 6:25962

GERMANIUM DETECTORS
See GE SEMICONDUCTOR DETECTORS
GERMANY (FEDERAL REPUBLIC)
See FEDERAL REPUBLIC OF GERMANY
GIANT CELLS
See TUMOR CELLS
GLASS
See also BOROSILICATE GLASS
Thermal Conductivity
Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations, 6:25687
GLASS INDUSTRY
Waste Heat Utilization
Direct heat exchanger: Saturne recuperator, 6:25776 (CONF-800272—)
GLAUBER'S SALT
See SODIUM SULFATES
GLIOBLASTOMAS
See NEOPLASMS
GLUON MODEL
(Describes the interaction of a neutral massive vector field with a massive spinor field.)
Topics in the theory of heavy-quark systems, 6:26520 (LBL—12558)
GLUONS
Fusion Reactions
Gluon fusion, 6:26535
Leptoproduction of heavy quarks, 6:26534
GLUTARIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908
GLYCINE HISPIDA
Productivity
Response of field-grown soybeans to acid precipitation alone and in combination with sulfur dioxide, 6:26346 (CONF-800365—)
GLYCOSYL HYDROLASES
Enzyme Activity
/beta/-glucosidase production by aspergillus phoenicis in stirred-tank fermentors, 6:25288
GOLD
Deposition
dc sputter gold deposition on beryllium-copper contacts, 6:26050 (BDX—613-2629)
Photoemission
Photoemission measurements for low energy x-ray detector applications, 6:26609 (LA-UR—81-1712)
GOLD ALLOYS
Melting
Pulsed laser mixing of Ni-Au surface films on nickel substrates, 6:25895 (CONF-801124—50)
GOLDSTONE BOSONS
(Massless particles occurring in certain broken-symmetry theories.)
Particle Production
Technicoloured signatures, 6:26564
GRAIN BOUNDARIES
Computerized Simulation
Energies of <110> coincidence twist boundaries, stacking faults, and free surfaces in metal oxides with NaCl structure, 6:26613 (CONF-800765—9)
GRANITES
Experiment Planning
Effect of strain rate and stress corrosion on the long-term strength of crystalline rocks. Progress report, September 1, 1980-March 15, 1981, 6:26426 (DOE/ER/10762—1)
Fracture Properties
Effect of strain rate and stress corrosion on the long-term strength of crystalline rocks. Progress report, September 1, 1980-March 15, 1981, 6:26426 (DOE/ER/10762—1)
Hydraulic Fracturing
Interpretation of a hydraulic fracturing experiment, Monticello, South Carolina, 6:26431
Hydrology
Injection versus pressure pulse borehole tests in fractured crystalline rocks: observations and recent experiences, 6:26409 (LBL—12076)
Permeability
Large-scale permeability testing at Stripa, 6:26406 (LBL—12076)
Radionuclide Migration
Groundwater-stream-simulation experiments for the evaluation of the safety of proposed nuclear waste repositories, 6:25120 (CONF-810722—1)
Nevada Nuclear Waste Storage Investigations. Radionuclide migration in tuff and granite: peer review documentation, 6:25128 (NVO—196-23)
GRAPHITE
Activation Analysis
Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)
Atom Collisions
Interaction between a He atom and a graphite surface (Theoretical study of interaction potential), 6:26474
Bending
Effect of couple-stress on the pure bending of a prismatic bar, 6:25946 (GA-A—16001)
Mechanical Properties
Strength of nonuniformly oxidized PGX graphite, 6:25948 (GA-A—16270)
Oxidation
Strength of nonuniformly oxidized PGX graphite, 6:25948 (GA-A—16270)
Vapor Deposited Coatings
Chemical vapor deposition of TiB_2 from diborane (600 to 900°C), 6:25938
GRASS
Energy Source Development
Production of nonwoody land plants as a renewable energy source, 6:25282
GREAT BRITAIN
See UNITED KINGDOM
GREENHOUSES
Design
100% passive solar-heated underground structure, 6:25695 (CONF-800438—)
Plant Growth
Solar energy utilization in a greenhouse/animal shelter combination, 6:25811
Solar Space Heating
Analysis and summary of a solar air collector-groundwater heat storage-greenhouse heating system, 6:25354
Enhancing passive solar heating of commercial greenhouses, 6:25353
Kube Pak commercial greenhouse solar demonstration project, 6:25356
Low temperature solar heating of greenhouses, 6:25355
Thermal Insulation
Progress in movable blanket insulation systems for greenhouses, 6:25729
Underground
100% passive solar-heated underground structure, 6:25695 (CONF-800438—)
Waste Heat Utilization
Use of low-grade reject heat (Book chapter), 6:25618
GROSS DOMESTIC PRODUCT
Energy Demand
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
GROUND SOURCE HEAT PUMPS
Surveys
Geothermal policy project. Quarterly report, November 1, 1979-January 31, 1980, 6:25407 (DOE/SF/01795—T2)
GROUND SUBSIDENCE
Computerized Simulation
Why you see what you see looking down at an underground explosion, 6:26102 (UCID—19031)
Mathematical Models
Modeling of static mining subsidence in a nonlinear medium, 6:24934 (LBL—11896)
GROUND UPLIFT
Computerized Simulation
Why you see what you see looking down at an underground explosion, 6:26102 (UCID—19031)

GROUND WATER
Acidification
Acid groundwater in southwestern Sweden, 6:26252 (CONF-800365—)
Chemical Composition
Assessment of the impact of radionuclides in coal ash, 6:24905 (MLM—2829(OP))
Environmental Effects
Methodology to evaluate the potential for ground water contamination from geothermal fluid releases. Final report, 6:25395 (PB—81-111114)
Flow Models
Computer simulation of groundwater flow at a commercial radioactive-waste landfill near West Valley, Cattaraugus County, New York, 6:25116 (CONF-801217—)
Conceptual analysis of the groundwater flow system at the Maxey Flats radioactive waste burial site, Fleming County, Kentucky, 6:25115 (CONF-801217—)
Modeling in low-level radioactive waste management from the US Geological Survey perspective, 6:25108 (CONF-801217—)
Fluid Flow
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Role of well testing in civil engineering, 6:26096 (LBL—12076)
Hydrology
Review of water-well data from the unconfined aquifer in the eastern and southern parts of the Pasco Basin, 6:26417 (RHO-BWI-C—56)
Quantitative Chemical Analysis
Properties of acidified waters, 6:26117 (CONF-800365—)
Radionuclide Migration
Groundwater-stream-simulation experiments for the evaluation of the safety of proposed nuclear waste repositories, 6:25120 (CONF-810722—1)
Modeling in low-level radioactive waste management from the US Geological Survey perspective, 6:25108 (CONF-801217—)
GROUND-WATER RESERVES
See AQUIFERS
GTRR REACTOR
Reactor Operation
Reactor Sharing Program. Final program report for the period, July 1, 1979 through December 31, 1979, 6:25508 (DOE/ER/04206—T1)
GULF GENERAL ATOMIC FAST BREEDER REACTOR
See GCFR REACTOR

H

HADRON-HADRON INTERACTIONS
Diffraction Models
Dip and kink structures in high energy diffraction dissociation processes, 6:26530
Elastic Scattering
Dip and kink structures in high energy diffraction dissociation processes, 6:26530
Inclusive Interactions
Higher twist QCD terms in high-P/sub T/ pion production, 6:26533
Review on DTU-parton model for hh and hA collisions, 6:26531
Parton Model
Review on DTU-parton model for hh and hA collisions, 6:26531
Transverse Momentum
QCD corrections to hadronic large p/sub T/ scattering, 6:26532
HADRONS
See also BARYONS
MESONS
Particle Production
TASSO results on jets and QCD, 6:26513
Spin
Past lessons and future importance of polarization, 6:26559 (ANL-HEP—80-77)
Structure Functions
Structure functions and high twist contributions in perturbative quantum chromodynamics, 6:26548
Structure functions and high twist contributions in perturbative quantum chromodynamics, 6:26553
HALL GENERATORS
See MHD GENERATORS
HANDICAPPED PEOPLE
Transport
User-side subsidies for shared-ride taxis in Kinston, North Carolina. Final report, 6:25756 (UMTA-NC—06-0002-80-1)
HANFORD RESERVATION
Birds
Raptors of the Hanford Site and nearby areas of southcentral Washington, 6:26177 (PNL—3212)
Geology
Site characterization plan basalt waste isolation project, 6:25136 (RHO-BWI-CD—51(Rev.2))
Hydrology
Site characterization plan basalt waste isolation project, 6:25136 (RHO-BWI-CD—51(Rev.2))
Radioactive Waste Disposal
Verification of partially saturated zone moisture migration: model and field facilities, 6:25113 (CONF-801217—)
Radioactive Waste Storage
Tank-farm-waste-volume projections, 6:25139 (RHO-CD—80-615)
HASTELLOY X
Mechanical Properties
Progress in understanding the mechanical behavior of pressure-vessel materials at elevated temperatures, 6:25899 (CONF-810625—18)
HAWAII
Energy Models
Energy modeling. Volume II. Inventory and details of state energy models (Book), 6:25592 (DOE/CS/10046—2(Vol.2))
Volcanoes
Health hazard evaluation determination report no. HE 79-31-699, University Corporation for Atmospheric Research, Mauna Loa Observatory, Hilo, Hawaii 96720, 6:26151 (PB—81-111247)
Wind Power
Techniques for assessing the wind energy resource in Hawaii and Pacific Islands region, 6:25419 (PNL—3673)
HAZARDOUS MATERIALS
Risk Assessment
Risk assessment and radioactive waste management, 6:25117 (CONF-801217—)
Waste Management
Risk assessment and radioactive waste management, 6:25117 (CONF-801217—)
H-COAL PROCESS
Catalysts
H-Coal technology, progress toward commercialization, 6:24894
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883
Chemical Reactors
H-Coal technology, progress toward commercialization, 6:24894
Commercialization
H-Coal technology, progress toward commercialization, 6:24894
Flowsheets
H-Coal technology, progress toward commercialization, 6:24894
Pilot Plants
H-Coal technology, progress toward commercialization, 6:24894
Planning
H-Coal technology, progress toward commercialization, 6:24894

Radiometric Gages
Design and use of density gauges for fossil-energy processes (Catalyst level detector), 6:24873 (SAND—81-1347C)

HE-3 COUNTERS
Multi-Channel Analyzers
Remote detection system, 6:26078 (LA—8814-MS)

HEALTH HAZARDS
See also RADIATION HAZARDS
Management
Guidance for implementing an Environmental, Safety and Health Assurance Program. Volume 9. Model guidelines for environmental safety and health analysis activities, 6:26403 (SAND—81-0640)
Program standard for assuring that today's management obligations in environmental, safety, and health areas are met, 6:25607 (SAND—81-1359C)
Risk Assessment
Development and application of terrestrial food chain models to assess health risks to man and releases of pollutants to the environment, 6:26192 (IAEA-SM—254/63)

HEALTH PHYSICS RESEARCH REACTOR
See HPRR REACTOR

HEALTH SERVICES
Cost Benefit Analysis
Reduced-form approach for evaluating hospital cost-containment program in paired experiment, 6:26402 (CONF-8008109—1)

HEAT ENGINES
See also STIRLING ENGINES
Brayton Cycle
Some heat engine cycles in which liquids can work, 6:26624
Liquids
Some heat engine cycles in which liquids can work, 6:26624
Stirling Cycle
Some heat engine cycles in which liquids can work, 6:26624

HEAT EXCHANGERS
See also DIRECT CONTACT HEAT EXCHANGERS
HEAT PUMPS
Design
Direct heat exchanger: Saturne recuperator, 6:25776 (CONF-800272—)
Failure Mode Analysis
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Heat Recovery
Direct heat exchanger: Saturne recuperator, 6:25776 (CONF-800272—)
Mechanical Vibrations
Experiments on vibration of heat-exchanger tube arrays in cross flow, 6:26020 (GA-A—16161)
Nondestructive Testing
Development of nondestructive-evaluation techniques for high-temperature ceramic heat-exchanger components. Semiannual report, October 1980-March 1981, 6:25934 (ANL/MSD/FE—81-1)
Reliability
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)

HEAT PUMPS
See also AIR SOURCE HEAT PUMPS
GROUND SOURCE HEAT PUMPS
SOLAR-ASSISTED HEAT PUMPS
WATER SOURCE HEAT PUMPS
Coefficient of Performance
Development of original water/steam heat pump for industrial applcations, 6:25779 (CONF-800272—)
Industrial heat pumps and their applications, 6:25778 (CONF-800272—)
Drying
Development of original water/steam heat pump for industrial applcations, 6:25779 (CONF-800272—)
Energy Efficiency
Proceedings of second Franco-American conference on industrial energy conservation, 6:25763 (CONF-800272—)
Heat Recovery
Development of original water/steam heat pump for industrial applcations, 6:25779 (CONF-800272—)
Performance Testing
Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980, 6:25720 (NBSIR—80-2145(DOE))
Process Heat
Development of original water/steam heat pump for industrial applcations, 6:25779 (CONF-800272—)
Research Programs
Swedish heat pump projects 1979: research, development, full-scale experiments, 6:25725 (PB—81-114530)
Uses
Industrial heat pumps and their applications, 6:25778 (CONF-800272—)

HEAT RECOVERY
Recovery of industrial waste heat (Book chapter), 6:25619

HEAT RECOVERY EQUIPMENT
Design
Heat recovery/thermal energy storage for energy conservation in food processing, 6:25816
Energy Efficiency
Ceramic heat-recovery systems for high-temperature furnaces, 6:25769 (CONF-800272—)
Feasibility Studies
Pipeline bottoming-cycle study: technological feasibility of the bottoming cycle. Task IIIC report, 6:25823 (GESP—785)
Performance
Ceramic recuperators for industrial flue-gas energy recovery, 6:25775 (CONF-800272—)
Performance Testing
Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980, 6:25720 (NBSIR—80-2145(DOE))

HEAT STORAGE
See also LATENT HEAT STORAGE
Economic Analysis
Storage in residential solar total-energy systems, 6:25389 (BNL—51230)
Feasibility Studies
Industrial thermal-storage applications, 6:25765 (CONF-800272—)

HEAT TRANSFER
Computer Codes
Computer program CCC: user's manual, 6:26475 (LBL—10909)
Computerized Simulation
Computer program CCC: user's manual, 6:26475 (LBL—10909)
Mathematical Models
Analytical models for simultaneous heat and moisture transport in soils, 6:25140 (RHO-LD—49)

HEAT TRANSMISSION
See HEAT TRANSFER

HEAVY ION ACCELERATORS
Cost
Economic 5-megajoule heavy-ion driver for mid-term fusion goals, 6:26685 (CONF-801011—101)
Mass Spectroscopy
Accelerator mass spectrometry and radioisotope detection at the Argonne FN tandem facility, 6:26070 (CONF-8006123—2)
Research Programs
Argonne's program in heavy-ion fusion, 6:26668 (CONF-800740—28)

HEAVY ION REACTIONS
See also ARGON 40 REACTIONS
BORON 10 REACTIONS
CARBON 12 REACTIONS
LITHIUM 7 REACTIONS
NEON 20 REACTIONS
OXYGEN 16 REACTIONS
Deep Inelastic Scattering
Experimental evidence and theoretical implications of fluctuations in deep inelastic heavy ion collisions, 6:26574 (LBL—12596)
Nuclear Models
Equilibrium statistical treatment of angular momenta associated with collective modes in fission and heavy-ion reactions, 6:26604

HEAVY NUCLEI
Neutron Reactions
Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions, 6:26597 (CONF-810606—53)
HEAVY WATER
Dielectric Properties
Dielectric relaxation of oil-external microemulsions, 6:25994
Hot Atom Chemistry
Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2i + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$, 6:26006
Ion-Molecule Collisions
Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2^+ + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$, 6:26006
Photolysis
Evidence for photodissociation of water vapor on reduced $SrTiO_3$ (111) surfaces in a high vacuum environment, 6:26000
Scintillation Counting
Simple and effective method for measurement of HTC and HT in environmental air, 6:25975
HEAVY WATER COOLANT
See HEAVY WATER
HELIOSTATS
Cost
Second-generation heliostat development. Volume 1. Detailed design report, 6:25307 (SAND—79-8192/1)
Design
Second-generation heliostat development. Volume 1. Detailed design report, 6:25307 (SAND—79-8192/1)
Solar central receiver heliostat mirror module development, 6:25306 (SAND—79-8189)
Fabrication
Solar central receiver heliostat mirror module development, 6:25306 (SAND—79-8189)
Maintenance
Second-generation heliostat development. Volume 1. Detailed design report, 6:25307 (SAND—79-8192/1)
HELIUM
Collisions
Interaction between a He atom and a graphite surface (Theoretical study of interaction potential), 6:26474
Muonic Atoms
Calculation of the 3p-3d transitions in muonic helium, 6:26455
Polarizability
Dielectric constant of atomic fluids with variable polarizability, 6:26471
HELIUM 3 REACTIONS
Total Cross Sections
Nuclear cross sections for light ions on ^{6}Li (100 keV to several MeV), 6:26577 (CONF-801111—47)
HELIUM 4 TARGET
Pion Reactions
Inclusive reactions of pions on nuclei, 6:26575
HELIUM HYDRIDES
Ion Spectroscopy
Foil dissociation of fast molecular ions into atomic excited states, 6:26449 (CONF-801111—49)
HELIUM II
Convection
Stationary convection in dilute solutions of ^{3}He in superfluid ^{4}He, 6:26479
Vortex Flow
Transverse normal modes of finite vortex arrays, 6:26477
HELIUM IONS
Excited States
Foil dissociation of fast molecular ions into atomic excited states, 6:26449 (CONF-801111—49)
HELIUM METHOD
See ISOTOPE DATING
HERBICIDES
Biological Accumulation
Environmental destinies of insecticides, herbicides, and fungicides in the plants, animals, soil, air, and water of homologous microcosms, 6:26397
HETEROJUNCTIONS
Electrical Properties
Heterojunction solar cells on cuprous oxide, 6:25272
Fabrication
Heterojunction solar cells on cuprous oxide, 6:25272
HEWLETT-PACKARD COMPUTERS
See HP COMPUTERS
HEXAMETHYLENETETRAMINE
See UROTROPIN
HICHLOR PROCESS
Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980, 6:24929 (IS—4773)
HIGGS BOSONS
Mass
Phase transitions and bounds on Higgs-boson masses, 6:26569
Particle Identification
Could Higgs bosons be found before LEP, 6:26565
Vortex Flow
Vortex excitations in the Weinberg-Salam theory, 6:26568
HIGH BTU GAS
Chemical Composition
Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant, 6:24848 (DOE/ET/13060—T4)
Production
COthane, methane from waste CO. Final technical report, 6:25182 (DOE/CS/40177—T2)
HIGH ENERGY PHYSICS
Meetings
Proceedings of topical workshop on the production of new particles in super high energy collisions, 6:26481
HIGH EXPLOSIVES
See CHEMICAL EXPLOSIVES
HIGH-BETA PLASMA
Plasma Macroinstabilities
Finite Larmor radius theory of resistive instabilities, 6:26650
HIGH-FREQUENCY HEATING
See also ECR HEATING
Hybrid Resonance
Lower-hybrid heating and current drive system for the STARFIRE tokamak, 6:26628 (CONF-801011—97)
HIGH-TEMPERATURE GAS-COOLED REACTOR
See HTGR TYPE REACTORS
HIGHWAYS
See ROADS
HOG FUEL
See WOOD WASTES
HOISTS
Cost
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix C. Heavy hoist. Final report, 6:25210 (EPRI-EM—1589(Vol.8)(App.C))
Design
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix C. Heavy hoist. Final report, 6:25210 (EPRI-EM—1589(Vol.8)(App.C))
HOLMIUM ALLOYS
Phase Studies
High-temperature Moessbauer study of ^{57}Fe interstitials in Chevrel phases, 6:25945 (CONF-800954—4)
HOPPERS
Valves
W-K-M Dyna-Seal Ball Valve METC SOA Test Valve No. A-7, state-of-the-art lockhopper valve-testing and development project. Summary test report, 6:24854 (DOE/MC—159)
HOSPITALS
Health Services
Reduced-form approach for evaluating hospital cost-containment program in paired experiment, 6:26402 (CONF-8008109—1)
HOT CELLS
Hot-cell verification facility, 6:25512 (HEDL-SA—2316-FP)

Ventilation Systems
Design guides for cell atmosphere controls, utilities and fire protection, 6:26317 (DP-MS—81-1)

HOT GAS CLEANUP
Fabric Filters
Evaluation of ceramic fiber filters for hot gas cleanup in pressurized fluidized-bed combustion power plants, 6:25444 (EPRI-CS—1846)

HOT WATER HEATERS
See WATER HEATERS

HOT-DRY-ROCK SYSTEMS
Heat Extraction
Development of man-made geothermal reservoirs, 6:25399 (LA-UR—81-852)
Hot dry rock geothermal energy development program. A progress report, 6:25400 (LA-UR—81-1265)
Research Programs
Development of man-made geothermal reservoirs, 6:25399 (LA-UR—81-852)

HOUSES
Direct Gain Systems
Passive solar in Milton Keynes, 6:25370
Monitoring
Passive solar in Milton Keynes, 6:25370
Solar Architecture
Integrated architectural and mechanical design for the Arizona State University energy efficient house and laboratory, 6:25733
Passive solar in Milton Keynes, 6:25370
Solar Heating Systems
Alternate Home Energy Application and Demonstration: Project AHEAD. Final report, 6:25342 (DOE/R5/10112—T1)
Group solar housing, 6:25371
Solar Space Heating
European community solar housing, 6:25368
Performance of passive-solar space-heating systems. Comparative report, 1979-1980 heating season, 6:25351 (SOLAR/0022—81/39)
Solar Atrium: a hybrid solar heating and cooling system, 6:25337 (DOE/CS/34135—T4)
Solar housing in London, 6:25369
Solar housing in the Netherlands, 6:25373
Solar Water Heating
Solar housing in the Netherlands, 6:25373

HP COMPUTERS
Translators
Code translation program for Hewlett-Packard computers, 6:26726 (SAND—81-0627)

HPRR REACTOR
Neutron Dosimetry
Reference dosimetry for various Health Physics Research Reactor spectra, 6:26612 (ORNL/TM—7748)
Neutron Spectra
Reference dosimetry for various Health Physics Research Reactor spectra, 6:26612 (ORNL/TM—7748)

HTGR TYPE REACTORS
Fuel Elements
Accuracy of finite-element models for the stress analysis of multiple-holed moderator blocks, 6:25485 (GA-A—16234)
Reactor Materials
Sorption of iodine on low-chromium-alloy steel, 6:25484 (CONF-810606—52)
Reactor Vessels
Assessment of long-term structural behavior of an asymmetric multi-cavity PCRV (900 MW(e)), 6:25486 (GA-A—16269)

HUMAN POPULATIONS
Radiation Doses
Systems model for evaluating population dose from low-level waste activities (Code BURYIT), 6:25168 (CONF-801217—)

HUMIDIFIERS
Energy Efficiency Standards
Background document for the advanced notice of proposed rulemaking for dishwashers, television sets, clothes washers, humidifiers and dehumidifiers. Topical report subtask 1.1: consumers products minimum energy efficiency standards program, 6:25726 (SAI—026-79-855-LJ)

HUMUS
Environmental Effects
Littoral-pelagial interactions: the role of dissolved humic materials, 6:26209 (DOE/EV/01599—T1(Pt.4))
Production
Raytheon Service Company experience and programs in resource recovery, 6:26057 (ANL/CNSV-TM—60)

HUNGARY
Research Programs
East Europe report: scientific affairs, No. 706, 6:26715 (JPRS—78269)

HVDC SYSTEMS
Electrical Transients
Multiterminal hvdc system representation in a transient stability program, 6:25480

HYBRID ELECTRIC-POWERED VEHICLES
Demonstration Programs
Electric and hybrid vehicle program. Quarterly report, January-February-March 1981, 6:25880 (DOE/CE—0011/14)
Flywheels
NTEV flywheel bearing integrity test, 6:25882 (DOE/CS/51213—T6)
Research Programs
Electric and hybrid vehicle program. Quarterly report, January-February-March 1981, 6:25880 (DOE/CE—0011/14)

HYDRAULIC FRACTURING
Economic Analysis
Economic analysis of foam fracturing in the Devonian shales: preliminary report, 6:25072

HYDRAULIC TURBINES
See also PUMP TURBINES
Availability
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)

HYDRIDES
Electronic Structure
Introduction to hydrogen in alloys, 6:25900 (CONF-8006130—3)
Mechanical Properties
Introduction to hydrogen in alloys, 6:25900 (CONF-8006130—3)
Phase Studies
Introduction to hydrogen in alloys, 6:25900 (CONF-8006130—3)

HYDROCARBON FUEL CELLS
Electrolytes
Definition of chemical and electrochemical properties of a fuel cell electrolyte. Final technical report 25 Mar 77-24 Jun 80, 6:25661 (AD—A-089776)

HYDROCARBON LOGGING
See GAS METERS

HYDROCARBONS
See also ALKANES
ANTHRACENE
BENZENE
NAPHTHALENE
POLYCYCLIC AROMATIC HYDROCARBONS
PYRENE
TETRALIN
TOLUENE
XYLENES
Air Pollution Control
Emissions characteristics of light-duty diesel vehicles, 6:25859 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4))
Fleet trials using methanol/gasoline blends, 6:25890 (DOE/BETC/IC—80/3(Vol.4))
Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4))
USAF aircraft engine emission goals: a critical review. Final report Sep 78-Jun 79, 6:25853 (AD—A-090282)

Biological Effects
Report to the Congress on ocean pollution and offshore development, October 1977 through September 1978. Annual report No. 6, 6:26298 (PB—81-118333)
Combustion Properties
Soot volume-fraction profiles in a free-combusting boundary layer, 6:26011 (LBL—12767)
Solubility
Micellar-flood research: biopolymers, interfacial and phase behavior, and competitive adsorbates, 6:25020 (DOE/BETC/IC—80/3(Vol.2))
Synthesis
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)

HYDROCHLORIC ACID
Chemical Reactions
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines. Progress report, August 16, 1980-April 30, 1981, 6:25996 (DOE/ER/03416—21)

HYDROELECTRIC POWER
Resource Assessment
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)

HYDROELECTRICITY
See HYDROELECTRIC POWER

HYDROGEN
Atom Collisions
Diabatic-state treatment of negative-meson moderation and capture. I. The hydrogen atom, 6:26464
Binding Energy
Atoms in molecules approach to density functional theory, 6:26462
Chemical Reactions
Hydrogen-carbon monoxide reactions in low-rank coal liquefaction, 6:24878
Laser-collision induced chemical reactions: A comparison of quantum mechanical and classical model results, 6:25999
Chemisorption
Chemisorption theory: Dissociation of H_2 on Ti(0001), 6:25927
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Desorption
Chemical makeup of Nb and Nb_3Sn films, 6:25983 (SAND—81-0969C)
Diffusion
Neutron-scattering study of hydrogen diffusion in thorium, 6:25930
Neutron scattering measurements of low-temperature hydrogen tunneling in niobium, 6:26608 (BNL—28332)
Dissociation
Chemisorption theory: Dissociation of H_2 on Ti(0001), 6:25927
Electronic Structure
Atoms in molecules approach to density functional theory, 6:26462
Electron-Molecule Collisions
Doubly differential cross sections of secondary electrons ejected from gases by electron impact: 25 —250 eV on H_2, 6:26465
Hot Atom Chemistry
Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2^+ + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$, 6:26006
Ion-Molecule Collisions
Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2^+ + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$, 6:26006
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies $\leq$ 400 MeV, 6:26610 (ORNL/TM—7818)
Recombination
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells. Final report (Hydrogen-oxygen gas recombination device), 6:25583 (ANL/OEPM—80-8)
Transport
Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)

HYDROGEN 1 TARGET
Neutron Reactions
Zero-crossing angle in the np analyzing power at medium energies and its relation to charge symmetry, 6:26576

HYDROGEN 2
See DEUTERIUM

HYDROGEN 3
See TRITIUM

HYDROGEN CHLORIDES
See HYDROCHLORIC ACID

HYDROGEN COMPOUNDS
Environmental Transport
Hydrogen, sulphur and nitrogen budgets in soils and catchments, 6:26275 (CONF-800365—)

HYDROGEN DONOR REACTIONS
See HYDROGEN TRANSFER

HYDROGEN EMBRITTLEMENT
Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)

HYDROGEN FUEL CELLS
Feasibility Studies
The adsorption and electrooxidation of simple hydrocarbons for direct oxidation hydrocarbon-air fuel cells, 6:25662 (AD—A-090377)

HYDROGEN IONS
See also HYDROGEN IONS 1 MINUS
HYDROGEN IONS 1 PLUS
HYDROGEN IONS 2 PLUS
HYDROGEN IONS 3 PLUS
Excited States
Foil dissociation of fast molecular ions into atomic excited states, 6:26449 (CONF-801111—49)

HYDROGEN IONS 1 MINUS
Ion Sources
Negative hydrogen ion production in a cw plasma source, 6:26470

HYDROGEN IONS 1 PLUS
Beam Neutralization
Possible non-hydrogen neutralizers for high energy D^+ and H^+ beams, 6:26704 (PPPL—1803)
Binding Energy
Atoms in molecules approach to density functional theory, 6:26462
Electronic Structure
Atoms in molecules approach to density functional theory, 6:26462

HYDROGEN IONS 2 PLUS
Collisions
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)

HYDROGEN IONS 3 PLUS
Collisions
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)

HYDROGEN NITRATES
See NITRIC ACID

HYDROGEN PEROXIDE
Chemical Reactions
Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909

HYDROGEN PRODUCTION
See also THERMOCHEMICAL PROCESSES
Photolysis
Evidence for photodissociation of water vapor on reduced $SrTiO_3$ (111) surfaces in a high vacuum environment, 6:26000

Thermochemical Processes
Substantive improvement of the thermal efficiency of the mercury-iodine thermochemical cycle ANL-4, 6:25176 (CONF-800616—10)

HYDROGEN SULFATES
See SULFURIC ACID

HYDROGEN SULFIDES
Recovery
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))
Removal
Geothermal hydrogen sulfide removal, 6:25394 (DOE/ET/27203—1)
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))

HYDROGEN TRANSFER
Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly progress report, September-November 1980, 6:24858 (DOE/PC/30080—T3)

HYDROGEN TRITIDE
Scintillation Counting
Simple and effective method for measurement of HTO and HT in environmental air, 6:25975

HYDROGENATION
Catalysts
Development of new catalysts for coal liquids refining. Sixth quarterly report, 1 April 1980-30 June 1980, 6:24864 (FE—2595-6)
Evaluation of a short-residence-time two-stage SRC process. Final report, 6:24861 (EPRI-AP—1827)

HYDROLOGY
Flow Models
Sulfate at Birkenes, a small forested catchment in southernmost Norway, 6:26277 (CONF-800365—)
Water residence distributions, 6:26205 (CONF-800365—)

HYDROXY COMPOUNDS
(For organic compounds only and excluding SACCHARIDES, GLYCOSIDES and HYDROXY ACIDS.)
See also ALCOHOLS
PHENOLS
Chemical Reactions
Coal structure cleavage mechanisms: scission of diphenylmethane and diphenyl ether linkages to hydroxylated rings, 6:24916
Emission Spectra
Luminescence characteristics of 3-hydroxyflavone as a function of pressure and viscosity, 6:26457

HYDROXYL RADICALS
Chemical Reactions
Radiation chemical studies of nickel-glycine. Hydrogen abstraction by OH radicals and oxidation by Br_2^- (Gamma radiation), 6:26003

HYDROXYNAPHTHALENES
See NAPHTHOLS

HYPERONS
See also LAMBDA PARTICLES
Magnetic Moments
Magnetic moments of quarks in baryons and mesons, 6:26510

HYTORT PROCESS
Hydrogasification of oil shale. Final report Jan 72-Dec 79, 6:25085 (PB—81-114092)

I

I-BEAM TYPE REACTORS
Heavy Ion Accelerators
Argonne's program in heavy-ion fusion, 6:26668 (CONF-800740—28)
Research Programs
Particle beam fusion progress report, January-June 1980, 6:26706 (SAND—80-2500)

ICES
Computer Codes
Preliminary evaluation of automated ICES selection methodology, cost, 6:25639 (CONF-800804—41)
Decision Making
Preliminary evaluation of automated ICES selection methodology, cost, 6:25639 (CONF-800804—41)

ICHTHYOPLANKTON
Population Dynamics
Chalk Point steam electric station studies Patuxent Estuary studies: ichthyoplankton population studies, 1979. Final report, 6:25465 (PB—81-111312)
Spatial Distribution
Chalk Point steam electric station studies Patuxent Estuary studies: ichthyoplankton population studies, 1979. Final report, 6:25465 (PB—81-111312)

IDAHO
Energy Sources
Eighteenth annual symposium on engineering geology and soils engineering, 6:26421
Three possible alternate energy schemes consistent with the geologic environment of the Snake River Plain, 6:25391
Geologic Faults
Estimating seismic hazards using past rupture patterns of faults near the eastern Snake River Plain, Idaho, 6:26424
Seismicity
Eighteenth annual symposium on engineering geology and soils engineering, 6:26421
Volcanism
Volcanic and seismic hazards on the eastern Snake River Plain, Idaho, 6:26422
Waste Disposal
Eighteenth annual symposium on engineering geology and soils engineering, 6:26421

IGNEOUS ROCKS
See also ANORTHOSITES
BASALT
GRANITES
PERIDOTITES
TUFF
Radionuclide Migration
Fracture flow modeling for low-level nuclear waste disposal, 6:25114 (CONF-801217—)

ILLINOIS
Biomass Conversion Plants
US Department of Energy midwest appropriate technology small grants program. Semi-annual technical progress report, 6:25193 (DOE/R5/10217—1)
Wind Power
Techniques for assessing the wind energy resource in the Great Lakes region, 6:25415 (PNL—3668)

IMAGES
Array Processors
Uniformly redundant arrays: digital reconstruction methods, 6:26623

IMPACT TESTS
Test Facilities
Sandia 25-meter compressed helium/air gun, 6:26046 (SAND—81-1477C)
Sandia shock thermodynamics applied research facility, 6:26047 (SAND—81-1528C)

IMPERFECTIONS
See DEFECTS

IMPERMEABLE DRY ROCK
See HOT-DRY-ROCK SYSTEMS

IMPINGEMENT
Bibliographies
Impingement and entrainment: an updated annotated bibliography. Final report, 6:26399 (EPRI-EA—1855)

INCLUSIVE DISTRIBUTION
See DISTRIBUTION

INCOLOY 800
Mechanical Properties
Progress in understanding the mechanical behavior of pressure-vessel materials at elevated temperatures, 6:25899 (CONF-810625—18)

INCONEL 718
Fatigue
Surface finish effects on the high-cycle fatigue of Alloy 718 (427 and 649°C), 6:25903 (EGG-M—01981)
IN-CORE FUEL MANAGEMENT
See FUEL MANAGEMENT
INDIANA
Wind Power
Techniques for assessing the wind energy resource in the Great Lakes region, 6:25415 (PNL—3668)
INDIUM COMPLEXES
Labelling
Tricatecholamide analogs of enterobactin as Ga and In radiopharmaceuticals, 6:26005
INDOOR AIR POLLUTION
Pollution Control
Ventilation requirements for control of occupancy odor and tobacco smoke odor: laboratory studies. Final report, 6:26400 (LBL—12589)
INDUSTRIAL PLANTS
See also CHEMICAL PLANTS
COAL GASIFICATION PLANTS
COAL LIQUEFACTION PLANTS
DESALINATION PLANTS
ETHANOL PLANTS
FEED MATERIALS PLANTS
OXYGEN PLANTS
WASTE PROCESSING PLANTS
High-temperature phase change thermal storage, 6:25766 (CONF-800272—)
Air Pollution Control
Status of pollution-control technologies for industrial boilers, 6:26063 (CONF-800608—7)
Boilers
Alternative-fuel price trajectories: preparation of MFBI size/usage overlays and new boiler order analysis. Subtask 3.3. Final report, 6:25800 (DOE/RG/10446—T2)
Capital and operating costs for industrial boilers. Final report Apr-Jun 79, 6:26061 (PB—81-105934)
Direct firing of coal-water suspensions: state-of-the-art review, 6:24965
Chemical Effluents
Soil acidification by SO_2 emissions in Alberta, Canada, 6:26141 (CONF-800365—)
Cogeneration
Fuel cell support studies: on-site molten carbonate systems. Final report 1 Dec 78-30 Nov 79, 6:25672 (PB—81-113672)
Industrial cogeneration (Book chapter), 6:25623
Industry/DOE diesel cogeneration demonstration program, 6:25767 (CONF-800272—)
Energy Conservation
Energy conservation campaign at Sandvik A.B. in Sandviken, 6:25792 (CONF-7910214—)
Fuel cell support studies: on-site molten carbonate systems. Final report 1 Dec 78-30 Nov 79, 6:25672 (PB—81-113672)
Energy Consumption
Direct firing of coal-water suspensions: state-of-the-art review, 6:24965
Energy Efficiency
Role of the industrial energy conservation in the US energy program, 6:25764 (CONF-800272—)
Engineering
Designing for the future: engineering plant, 6:25784 (CONF-7910214—)
Furnaces
Direct firing of coal-water suspensions: state-of-the-art review, 6:24965
Heat Recovery
Recovery of industrial waste heat (Book chapter), 6:25619
Process Heat
Solar industrial process heat: a study of applications and attitudes. Final report, 6:25350 (SERI/TR—98348-1)
Refuse-Fueled Boilers
Feasibility study: utilization of power plant waste heat and other resources in a proposed oil sunflower seed processing plant. Final report, 6:25806 (PB—81-115792)
Steam Generation
Economics of selected fuels for new industrial steam capacity, 6:25821
Waste Heat
Technical-economical aspects of mechanical energy production from waste heat by using organic fluids working on Rankine cycles, 6:25768 (CONF-800272—)
Waste Heat Utilization
Feasibility study: utilization of power plant waste heat and other resources in a proposed oil sunflower seed processing plant. Final report, 6:25806 (PB—81-115792)
Recovery of industrial waste heat (Book chapter), 6:25619
INDUSTRIAL SECTOR
See INDUSTRY
INDUSTRIAL WASTES
Anaerobic Digestion
Alleviation of environmental problems of waste disposal with production of energy and carbon dioxide, 6:25820
Enhancement of methane gas production using an industrial waste in anaerobic digestion, 6:25179 (CONF-801210—26)
Stabilization and gasification of soft-drink manufacturing waste by conventional and two-phase anaerobic digestion, 6:25819
Energy Recovery
Alleviation of environmental problems of waste disposal with production of energy and carbon dioxide, 6:25820
Energy recovery from industrial and vegetable wastes, 6:25774 (CONF-800272—)
Gasification
Stabilization and gasification of soft-drink manufacturing waste by conventional and two-phase anaerobic digestion, 6:25819
Stabilization
Stabilization and gasification of soft-drink manufacturing waste by conventional and two-phase anaerobic digestion, 6:25819
INDUSTRY
See also BEVERAGE INDUSTRY
CEMENT INDUSTRY
CHEMICAL INDUSTRY
COAL INDUSTRY
ELECTRIC POWER INDUSTRY
FOOD INDUSTRY
GLASS INDUSTRY
MEAT INDUSTRY
METAL INDUSTRY
NATURAL GAS INDUSTRY
NUCLEAR INDUSTRY
PAPER INDUSTRY
PLASTICS INDUSTRY
SOLAR INDUSTRY
SYNTHETIC FUELS INDUSTRY
TEXTILE INDUSTRY
WOOD PRODUCTS INDUSTRY
Air Pollution
Waste disposal inventory for Mississippi-Alabama coastal counties, 6:26160 (PB—81-118994)
Energy Audits
Energy auditing in connection with subsidy schemes for energy saving investments, 6:25793 (CONF-7910214—)
Energy Conservation
Canada's voluntary industrial energy conservation programme, 6:25788 (CONF-7910214—)
Conserving energy by eliminating waste, 6:25787 (CONF-7910214—)
Energy conservation in French industry and at Rhone-Poulenc, 6:25794 (CONF-7910214—)
Facts about industrial energy conservation in the United States, 6:25676 (CONF-7910214—)
French industry and the energy conservation challenge, 6:25789 (CONF-7910214—)
Impact of government incentives on the market for energy-saving technologies in the US industrial sector, 6:25781 (CONF-800272—)
Proceedings of second Franco-American conference on industrial energy conservation, 6:25763 (CONF-800272—)
Land Pollution
Waste disposal inventory for Mississippi-Alabama coastal counties, 6:26160 (PB—81-118994)
Solar Process Heat
Application of solar thermal energy to buildings and industry, 6:25349 (SERI/TP—641-1222)
Subsidies
Energy auditing in connection with subsidy schemes for energy saving investments, 6:25793 (CONF-7910214—)

Water Pollution
Waste disposal inventory for Mississippi-Alabama coastal counties, 6:26160 (PB—81-118994)
INFORMATION SYSTEMS
Development of an automated project tracking system for the Bartlesville Energy Technology Center, 6:26716 (DOE/BETC/IC—80/3(Vol.4))
INORGANIC COMPOUNDS
Chemical Reactions
Shock-induced inorganic chemistry (66 references), 6:25985 (SAND—81-1455C)
INSECTICIDES
Biological Accumulation
Environmental destinies of insecticides, herbicides, and fungicides in the plants, animals, soil, air, and water of homologous microcosms, 6:26397
Stream microcosm for environmental assessment of pesticides, 6:26395
Biological Effects
Evaluation of toxicant effects on structure and function of model stream communities: correlations with natural stream effects, 6:26394
Environmental Effects
Stream microcosm for environmental assessment of pesticides, 6:26395
Environmental Transport
Fate and behavior of pesticides in a compartmentalized microcosm, 6:26193
INSECTS
Ionic Composition
Effect of acid pH on sodium and chloride balance in an inhabitant of acid freshwaters: the waterbug Corixa punctata (Illig.) (Insecta, Hemiptera), 6:26382 (CONF-800365—)
IN-SITU COMBUSTION
Mathematical Models
Numerical modeling of thermal recovery processes SUPRI-TR-12, 6:25034 (DOE/ET/12056—12)
IN-SITU GASIFICATION
Borehole Linking
Pricetown I underground coal gasification field test: operations report, 6:24869 (MLM-MU—81-62-0007)
Data Acquisition Systems
Pricetown I underground coal gasification field test: operations report, 6:24869 (MLM-MU—81-62-0007)
Evaluation
Uncovering and evaluation of a twenty-five-year-old underground-coal-gasification burn at a site in Gorgas, Alabama, 6:24856 (DOE/MC/17783—T1)
Remote Sensing
Statistical model fitting of remote induction sounding data from underground coal gasification site--Hanna II, phases 2 and 3, 6:24885
Reverse Combustion
Pricetown I underground coal gasification field test: operations report, 6:24869 (MLM-MU—81-62-0007)
Test Facilities
Outlook for in situ gasification of eastern coal, 6:24897
IN-SITU PROCESSING
See also IN-SITU COMBUSTION
IN-SITU GASIFICATION
Cost Benefit Analysis
rf heating of Utah tar sands. Final report, October 1978-December 1979, 6:25083 (DOE/CH/90035—4)
INSOLATION
Data
Measurements of typical insolation variation at Daggett, California. Volume II. Appendices including data sets, 6:25225 (ATR—80(7747)-1(Vol.2))
Data Acquisition
On-site quality control of insolation measurements, 6:25227
Experimental Data
Measurements of typical insolation variation at Daggett, California. Volume I. Methodology and sample data, 6:25224 (ATR—80(7747)-1(Vol.1))
Research Programs
Solar-meteorological research program for the South-Central US, 6:25226
INSTRUMENTS (MEASURING)
See MEASURING INSTRUMENTS
INSULATION (THERMAL)
See THERMAL INSULATION
INTAKE STRUCTURES
Environmental Impacts
Assessment of the impacts of water intakes on alewife, rainbow smelt, and yellow perch populations in Lake Michigan, 6:26296 (ANL/ES—109)
Technology Assessment
Cooling water intake screening devices used to reduce entrainment and impingement. Topical briefs: fish and wildlife resources and electric power generation, No. 9, 6:25468 (PB—81-116055)
INTEGRALS
Numerical Analysis
Numerical evaluation of integrals containing a spherical Bessel function by product integration, 6:26731
INTEGRATED COMMUNITY ENERGY SYSTEMS
See ICES
INTEGRATED UTILITY SYSTEMS
See TOTAL ENERGY SYSTEMS
INTERCONNECTED POWER SYSTEMS
Capacity
Oil savings from greater intertie capacity between the Pacific Northwest and California. Report to the Secretary of Energy, 6:25641 (PB—81-103392)
Cost Benefit Analysis
Oil savings from greater intertie capacity between the Pacific Northwest and California. Report to the Secretary of Energy, 6:25641 (PB—81-103392)
INTERFACES
Chemical Composition
VII. Overview of current status of solid-gas interface science, 6:25979 (IS-M—316)
INTERFEROMETERS
Fabrication
Design and fabrication of a high-damage threshold infrared Smattt interferometer, 6:26696 (LA-UR—81-1395)
INTERMEDIATE BOSONS
See also HIGGS BOSONS
INTERMEDIATE VECTOR BOSONS
Charged-Current Interactions
Multi-W and Z Bosons, 6:26541
Leptonic Decay
Radiative corrections in the standard model, 6:26540
Mass Formulae
Multi-W and Z Bosons, 6:26541
Radiative corrections in the standard model, 6:26540
Neutral-Current Interactions
Multi-W and Z Bosons, 6:26541
Particle Widths
Radiative corrections in the standard model, 6:26540
Semileptonic Decay
New quark and weak boson signatures at p-barp colliders, 6:26536
INTERMEDIATE VECTOR BOSONS
Pair Production
Pair production of intermediate vector bosons, 6:26556
INTERNAL COMBUSTION ENGINES
See also DIESEL ENGINES
GAS TURBINE ENGINES
SPARK IGNITION ENGINES
STRATIFIED CHARGE ENGINES
Automotive Fuels
Evaporative emissions from vehicles operating on methanol/gasoline blends, 6:25889 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4))
Exhaust Gases
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4))

Fleet trials using methanol/gasoline blends, 6:25890 (DOE/BETC/IC—80/3(Vol.4))
Fuel Economy
Automotive fuel economy: potential improvement through selected engine lubricants, 6:25858 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4))
Fleet trials using methanol/gasoline blends, 6:25890 (DOE/BETC/IC—80/3(Vol.4))
Lubricating Oils
Automotive fuel economy: potential improvement through selected engine lubricants, 6:25858 (DOE/BETC/IC—80/3(Vol.4))
INTOR TOKAMAK
High-Frequency Heating
Internal resistive initiation coil electromagnetics in the FED/INTOR baseline design, 6:26633 (LA—8784-MS)
INVERTEBRATES
See also ANNELIDS
MOLLUSCS
NEMATODES
PROTOZOA
Population Dynamics
Effects of elevated temperatures on macroinvertebrate populations in the Browns Ferry experimental ecosystems, 6:26329
Evaluation of toxicant effects on structure and function of model stream communities: correlations with natural stream effects, 6:26394
Sensitivity
Acid precipitation and soil buffering capacity, 6:26336 (CONF-800365—)
INVERTERS
Circuit Theory
Analysis and test of line-commutated inverters for use in photovoltaic power systems, 6:25296 (DOE/ET/20279—115)
Electrical Properties
Analysis and test of line-commutated inverters for use in photovoltaic power systems, 6:25296 (DOE/ET/20279—115)
IODIDES
Adsorption
Adsorption on inorganic materials. 8. Adsorption of iodide on AgCl-filled carbon, 6:25973
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977
IODINE
Absorption Spectra
Photoionization of atomic iodine and atomic tellurium, 6:26467
Chemical Reactions
Improved efficiency in the sulfur dioxide-iodine hydrogen cycle through the use of magnesium oxide, 6:25177 (LA-UR—81-1050)
Photoionization
Photoionization of atomic iodine and atomic tellurium, 6:26467
Photoionization of atomic iodine and atomic tellurium, 6:26447 (CONF-800626—8)
ION BEAM TYPE REACTORS
See I-BEAM TYPE REACTORS
ION COLLISIONS
See also ION-ATOM COLLISIONS
ION-ION COLLISIONS
Charge Exchange
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)
ION PROPULSION
Environmental Effects
Initial assessment of the effects of energetic-ion injections in the magnetosphere due to the transport of satellite-power-system components from low earth orbit to geosynchronous earth orbit, 6:26436 (DOE/CH/10048—1)
ION SOURCES
Theory of AMPFION class ion diodes, 6:26708 (SAND—81-0599C)
Beam Transport
Plasma channels for intense ion beam transport: theory, 6:26707 (SAND—81-0477C)
Computerized Simulation
Electron and ion flows in diodes. Final report 19 Mar 79-18 Jun 80, 6:26444 (AD—A-089736)
Diode Tubes
Electron and ion flows in diodes. Final report 19 Mar 79-18 Jun 80, 6:26444 (AD—A-089736)
Emission Spectra
Balmer alpha emission and hydrogen atom energy in ion-source discharges, 6:26703 (PPPL—1797)
Energy Spectra
Balmer alpha emission and hydrogen atom energy in ion-source discharges, 6:26703 (PPPL—1797)
ION-ATOM COLLISIONS
Collisional processes of interest in MFE plasma research. Progress report No. 4, April 1, 1981-May 31, 1981, 6:26631 (DOE/ET/53025—T8)
ION-ION COLLISIONS
Collisional processes of interest in MFE plasma research. Progress report No. 4, April 1, 1981-May 31, 1981, 6:26631 (DOE/ET/53025—T8)
IONIZING RADIATIONS
Biological Radiation Effects
Biological effects of ionizing radiation at the molecular, cellular, and organismal levels. Progress report, October 15, 1978-October 14, 1981, 6:26316 (DOE/EV/10503—1)
IONOSPHERE
Barium Ions
Cameo barium releases : E/sub parallel/ fields over the polar cap, 6:26440
Electric Fields
Cameo barium releases : E/sub parallel/ fields over the polar cap, 6:26440
Heating
Impact of Satellite Power Systems on the Ionosphere, 6:25294 (DOE/CH/10003—1)
Radiation Heating
Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments, 6:26437 (DOE/ER/10160—4)
IONS
See also CARBANIONS
MOLECULAR IONS
Solvation
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
IOWA
Wind Power
Techniques for assessing the wind energy resource in the North Central region, 6:25414 (PNL—3667)
IRIDIUM 191 TARGET
Triton Reactions
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
IRIDIUM 193
Energy Levels
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
IRIDIUM 193 TARGET
Triton Reactions
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
IRIDIUM 195
Energy Levels
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
IRIDIUM 197
Energy Levels
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
IRON
Catalytic Effects
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)

Chemical Preparation
Studies on unusually reactive metal powders. Preparation on new organometallic and organic compounds including potential new catalysts. Progress report, July 1, 1980-March 15, 1981, 6:25991 (DOE/ER/10603—1)
Comparative Evaluations
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883
Environmental Transport
Metal tracers in two marine microcosms: sensitivity to scale and configuration, 6:26290
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
Solvent Extraction
Evaluation of the removal of organic sulfur from coal, 6:24866 (IS-M—317)

IRON 57
Moessbauer Effect
High-temperature Moessbauer study of ^{57}Fe interstitials in Chevrel phases, 6:25945 (CONF-800954—4)
Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ under extermal magnetic fields, 6:25897 (CONF-801134—16)

IRON ADDITIONS
Phase Studies
High-temperature Moessbauer study of ^{57}Fe interstitials in Chevrel phases, 6:25945 (CONF-800954—4)

IRON ALLOYS
Hyperfine Structure
Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ under extermal magnetic fields, 6:25897 (CONF-801134—16)
Magnetic Properties
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
Superconductivity
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
Tensile Properties
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)

IRON BORIDES
Catalytic Effects
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Comparative Evaluations
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Reduction
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Sorptive Properties
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)

IRON COMPLEXES
Photolysis
Disproportionation of semimethylene blue and oxidation of leucomethylene blue by methylene blue and by Fe(III). Kinetics, equilibria, and medium effects, 6:26001
Redox Reactions
Disproportionation of semimethylene blue and oxidation of leucomethylene blue by methylene blue and by Fe(III). Kinetics, equilibria, and medium effects, 6:26001

IRON COMPOUNDS
Magnetization
Muon states in the antiferromagnetic oxides α-Fe_2O_3 and $FeTiO_3$, 6:25950 (LA-UR—81-1017)

IRON OXIDES
Magnetization
Muon states in the antiferromagnetic oxides α-Fe_2O_3 and $FeTiO_3$, 6:25950 (LA-UR—81-1017)
Materials Recovery
Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980, 6:24929 (IS—4773)
Assessment of the environmental impact of power plant fly ash, 6:24933 (IS-M—309)

IRON SULFIDES
See also PYRITE
Catalytic Effects
Effects of catalysts on short contact time coal liquefaction, 6:24882
Chemical Reactions
Desulfurization of coal by oxidation in alkaline solutions, 6:24867 (IS-M—318)
Phase Diagrams
Phase relationships in positive electrodes of high-temperature lithium aluminum/iron sulfide cells, 6:25587 (CONF-8010159—11)

IRON-NICKEL BATTERIES
Performance
Progress and forecast in electric-vehicle batteries, 6:25878 (CONF-800939—2)
Research Programs
Near-term batteries for electric vehicles, 6:25586 (CONF-810315—13)

IRRIGATION
Computerized Simulation
Computer analysis to compare the energy consumption of variable and constant speed pumps for agricultural irrigation, 6:25810
Economic Analysis
Economic analysis of life cycle costing irrigation pipe network design, 6:25808
Pipelines
Economic analysis of life cycle costing irrigation pipe network design, 6:25808

ISOBUTYL ALCOHOL
See 2-METHYLPROPANOL

ISOTOPE DATING
Mass Spectroscopy
Mass spectrometry with a very small cyclotron, 6:26071 (LBL—12797)

ITALY
Energy Demand
Energy and value, 6:25600 (ORAU/IEA—81-5(M))

IUS
See TOTAL ENERGY SYSTEMS

J

J-3105 RESONANCES
See PSI-3105 RESONANCES

JAILS
See PUBLIC BUILDINGS

JAPAN
Energy Demand
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
Energy conservation at the Nippon Steel Corporation, 6:25790 (CONF-7910214—)
Energy Policy
Energy conservation at the Nippon Steel Corporation, 6:25790 (CONF-7910214—)
Energy Supplies
Energy conservation at the Nippon Steel Corporation, 6:25790 (CONF-7910214—)
Resource Recovery Facilities
New generation - the Flakt recovery system, 6:25831 (ANL/CNSV-TM—60)
JET ENGINE FUELS
Combustion Heat
Thermodynamics of organic compounds, 6:25058 (DOE/BETC/IC—80/3(Vol.4))
JETS
Mathematical Models
Analytical model of the round buoyant jet, 6:26142 (CONF-810621—5)
JPL PROCESS
Comparative Evaluations
Evaluation of chemical coal cleaning processes, 6:24954

K

K-892 RESONANCES
Particle Widths
Radiative widths of K and rho mesons, 6:26509
Radiative Decay
Radiative widths of K and rho mesons, 6:26509
KANSAS
Earth-Covered Buildings
Operation characteristics of a utility-free dwelling in Kansas, 6:25363
KAOLINITE
Rock-Fluid Interactions
Adsorption from flooding solutions in porous media: a study of interactions of surfactants and polymers with reservoir minerals, 6:25013 (DOE/BETC/IC—80/3(Vol.2))
KAON MINUS-PROTON INTERACTIONS
Charge-Exchange Interactions
Inclusive kaon charge exchange in the triple-Regge region at high energies, 6:26487
Elastic Scattering
Real part of the forward elastic nuclear amplitude for pp, p-barp, πip, π^-p, K^+p, and K^-p scattering between 70 and 200 GeV/c, 6:26485
Inclusive Interactions
Inclusive kaon charge exchange in the triple-Regge region at high energies, 6:26487
KAON PLUS-PROTON INTERACTIONS
Elastic Scattering
Real part of the forward elastic nuclear amplitude for pp, p-barp, π^+p, π^-p, K^+p, and K^-p scattering between 70 and 200 GeV/c, 6:26485
KAON-PROTON INTERACTIONS
Elastic Scattering
Small angle hadron proton elastic scattering at Fermilab energies, 6:26496
KAONS
See also KAONS MINUS
Semileptonic Decay
Experimental constraints on models of CP violation, 6:26560
KAONS MINUS
Atom Collisions
Diabatic-state treatment of negative-meson moderation and capture. I. The hydrogen atom, 6:26464
KELP
See SEAWEEDS
KENTUCKY
Geology
Conceptual analysis of the groundwater flow system at the Maxey Flats radioactive waste burial site, Fleming County, Kentucky, 6:25115 (CONF-801217—)
Hydrology
Conceptual analysis of the groundwater flow system at the Maxey Flats radioactive waste burial site, Fleming County, Kentucky, 6:25115 (CONF-801217—)
Radioactive Waste Disposal
Conceptual analysis of the groundwater flow system at the Maxey Flats radioactive waste burial site, Fleming County, Kentucky, 6:25115 (CONF-801217—)
Wind Power
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)
KEROGEN
Oxidation
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
Structural Chemical Analysis
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
KETENES
Photolysis
Hypersonic beam laser photolysis. Technical progress report, July 15, 1980-March 15, 1981, 6:25997 (DOE/ER/06035—3)
KEVLAR
See ARAMIDS
KNOCK-ON ELECTRONS
See ELECTRONS
KRYPTON
Atom-Atom Collisions
Interaction potentials for Br(^{2}P)+Ar, Kr, and Xe (^{1}S) by the crossed molecular beams method, 6:26460
Laser Spectroscopy
Resonance ionization spectroscopy: counting noble-gas atoms, 6:26451 (CONF-8106100—1)
Separation Processes
Permeation cascades for the separation of krypton and xenon from nuclear reactor atmospheres, 6:25567
Separation of krypton and xenon by selective permeation, 6:25516
KVB PROCESS
Comparative Evaluations
Evaluation of chemical coal cleaning processes, 6:24954

L

LAKES
Acidification
Acid lakes and streams in the Galloway area, southwestern Scotland, 6:26264 (CONF-800365—)
Acidification impacts on lakes in the Sudbury, Ontario, Canada area, 6:26358 (CONF-800365—)
Acidification of Danish soft-water lakes, 6:26204 (CONF-800365—)
Acidification of Belgian moorland pools by acid sulfur-rich rainwater, 6:26263 (CONF-800365—)
Aluminum, a buffer in acidic waters, 6:26253 (CONF-800365—)
Analysis of lake acidification using annual budgets, 6:26267 (CONF-800365—)
Atmospheric inputs to three Adirondack lake watersheds, 6:26268 (CONF-800365—)
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. I. Sediment dating and chemical stratigraphy, 6:26271 (CONF-800365—)
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. III. Cladoceran community structure and stratigraphy, 6:26273 (CONF-800365—)

Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. IV. Synthesis, and comparison with New England, 6:26274 (CONF-800365—)
Comparison of benthic invertebrates in lakes with different acidity, 6:26378 (CONF-800365—)
Does the change of predator system contribute to the biotic development in acidified lakes, 6:26371 (CONF-800365—)
Environment and snails (Gastropoda): studies of 1000 lakes in Norway, 6:26374 (CONF-800365—)
Evolution of acidity in surface waters of Laurentides Park (Quebec, Canada) over a period of 40 years, 6:26255 (CONF-800365—)
Experimental acidification of a whole lake: a test of the oligotrophication hypothesis, 6:26206 (CONF-800365—)
Fish in naturally acidic lakes of northern Wisconsin, USA, 6:26380 (CONF-800365—)
Framework for the integrated lake-watershed acidification study, 6:26266 (CONF-800365—)
Have changes in use of land influenced the regional lake acidification, 6:26283 (CONF-800365—)
Historical land-use changes related to fish status development in different areas of southern Norway, 6:26201 (CONF-800365—)
Input-output budgets of major ions at gauged catchments in Norway, 6:26265 (CONF-800365—)
Mussels and crustaceans: studies of 1000 lakes in Norway, 6:26375 (CONF-800365—)
pH level and food organisms for fish: studies of 1000 lakes in Norway, 6:26376 (CONF-800365—)
Phytoplankton and zooplankton in acidified lakes in South Norway, 6:26379 (CONF-800365—)
Some aspects of acidification in southern Ontario, 6:26249 (CONF-800365—)
Sources of acidity in three lakes acidified during snowmelt, 6:26270 (CONF-800365—)
Widespread and diverse changes in the biota of North American lakes and rivers coincident with acidification, 6:26340 (CONF-800365—)

Chemical Composition
Preliminary characterization of three lake basins sensitive to acid precipitation in Nova Scotia, Canada, 6:26257 (CONF-800365—)

PH Value
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. II. Diatom stratigraphy and inferred pH, 6:26272 (CONF-800365—)
Effect of chemical weathering on surface waters, 6:26276 (CONF-800365—)
Use of microcosms to evaluate acid lake recovery techniques, 6:26236

Productivity
Thermal effects on primary productivity of phytoplankton, periphyton and macrophytes in Lake Keowee, South Carolina. Report for 1 Jul 72-30 Jun 76, 6:25466 (PB—81-112435)

Water Chemistry
Acidified lake districts of the world: a comparison of water chemistry of lakes in southern Norway, southern Sweden, southwestern Scotland, the Adirondack Mountains of New York, and southeastern Ontario, 6:26285 (CONF-800365—)
Chemical characteristics and buffer capacity of fifty alpine lakes (Italy, Pennine-Lepontine Alps), 6:26259 (CONF-800365—)
Decomposition and exchange processes in acidified lake sediment, 6:26279 (CONF-800365—)
Impact of acid precipitation on diatoms and chemistry of Dutch moorland pools, 6:26364 (CONF-800365—)
Regional surveys of the chemistry of small Norwegian lakes: a statistical analysis of the data from 1974 to 1978, 6:26258 (CONF-800365—)

Water Quality
Acid precipitation: the biotic response in Florida lakes, 6:26363 (CONF-800365—)
Lake acidification, fish damage, and utilization of outfields. A comparative survey of six highland areas, southeastern Norway, 6:26386 (CONF-800365—)

LAMBDA NEUTRAL
See LAMBDA PARTICLES

LAMBDA PARTICLES
Semileptonic Decay
Measurement of the vector and axial vector coupling constants in $\Lambda 0 \rightarrow p + e^- +$ nu-bar, 6:26505

LAMBDA-2250 RESONANCES
Semileptonic Decay
Role of non-spectator interactions in charm and bottom decays, 6:26539

LAND POLLUTION
Distribution
Brownian-motion model of pollutant-concentration distributions. Study on statistics and environmental factors in health (SIMS), 6:26145 (DOE/EV/10428—11)
Monitoring
Preliminary evaluation of DOE-NEPA monitoring system, 6:26147 (DOE/EV/10475—1)

LAND RECLAMATION
Cost Benefit Analysis
Engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26197 (DOE/UMT—0102)
Summary of the engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26198 (DOE/UMT—0102S)

LAND USE
Taxonomy of underground space, 6:26202 (CONF-800438—)
Environmental Effects
Historical land-use changes related to fish status development in different areas of southern Norway, 6:26201 (CONF-800365—)
Impact of land-use on the chemical composition of rain and snow in northern Minnesota, 6:26182 (CONF-800365—)
Regional Analysis
Have changes in use of land influenced the regional lake acidification, 6:26283 (CONF-800365—)

LANDFILLS
See SANITARY LANDFILLS

LANTHANIDES
See RARE EARTHS

LARGE COIL PROGRAM
Computer Codes
Using GIFTS on the Cray-1 for the large coil test facility test: stand design analysis, 6:26022 (ORNL/TM—7665)

LASER IMPLOSIONS
Rayleigh-Taylor Instability
Diffusion of magnetic field into an expanding plasma shell, 6:26660
Symmetry
Influences on target irradiation symmetry in CO_2 laser-fusion experiments, 6:26698 (LA-UR—81-1566)

LASER MIRRORS
Optical Properties
Deformable mirror study. Final report, 21 July 1980-15 May 1981, 6:26689 (DOE/DP/40052—T1)

LASER RADIATION
Energy
Simple optoacoustic energy meter for pulsed lasers, 6:26032 (CONF-810630—6)
Far Infrared Radiation
Effects of passive isolation on several optically pumped far-infrared laser lines, 6:26040
Photochemical Reactions
Laser-collision induced chemical reactions: A comparison of quantum mechanical and classical model results, 6:25999

LASER SPECTROSCOPY
Uses
Resonance ionization spectroscopy: counting noble-gas atoms, 6:26451 (CONF-8106100—1)

LASER-PRODUCED PLASMA
Electron Temperature
Absorpton and hot-electron production for 1.05 and 0.53 μm light on spherical targets, 6:26662
Energy Absorption
Absorpton and hot-electron production for 1.05 and 0.53 μm light on spherical targets, 6:26662

LASL
(Los Alamos Scientific Laboratory.)

Computer Graphics
Metafile for efficient sequential and random display of graphics, 6:26720 (LA-UR—80-3642)
LATENT HEAT STORAGE
Extended development of a sodium hydroxide thermal-energy storage module, 6:25579 (DOE/NASA/0138—1)
Feasibility Studies
High-temperature phase change thermal storage, 6:25766 (CONF-800272—)
LATEX
Biodegradation
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
Toxicity
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
LATHES
Performance
Ultraprecision machining of optics at Los Alamos, 6:26021 (LA-UR—81-1962)
LATTICE FIELD THEORY
Strong-Coupling Model
Strong-coupling expansion for the effective potential on a lattice, 6:26567
LATTICES (CRYSTAL)
See CRYSTAL LATTICES
LAWRENCE LIVERMORE LABORATORY
Air Pollution
Environmental monitoring at the Lawrence Livermore National Laboratory: 1980 annual report, 6:26200 (UCRL—50027-80)
Damage
Impact of the January-February 1980 earthquake sequence on various structures at the Lawrence Livermore National Laboratory, 6:25171 (UCRL—85460)
Noise Pollution
Environmental monitoring at the Lawrence Livermore National Laboratory: 1980 annual report, 6:26200 (UCRL—50027-80)
Radiation Monitoring
Environmental monitoring at the Lawrence Livermore National Laboratory: 1980 annual report, 6:26200 (UCRL—50027-80)
Research Programs
Program report for FY 1980. Atmospheric and Geophysical Sciences Division of the Physics Department, 6:26161 (UCRL—51444-80)
Safety
Impact of the January-February 1980 earthquake sequence on various structures at the Lawrence Livermore National Laboratory, 6:25171 (UCRL—85460)
Seismicity
Evaluation of the seismic integrity of a plutonium-handling facility, 6:25170 (UCRL—85458)
LEACHATES
Chemical Composition
Preliminary environmenal assessment of the University of Minnesota, Duluth Coal Gasifier, FY 1980, 6:26149 (ORNL/TM—7728)
Toxicity
Preliminary environmenal assessment of the University of Minnesota, Duluth Coal Gasifier, FY 1980, 6:26149 (ORNL/TM—7728)
LEAD
Biochemical Reaction Kinetics
Heavy-metal and nutrients effects on sediment oxygen demand in three-phase aquatic microcosms, 6:26224
Environmental Transport
Comparison of lead, manganese, and zinc transport in three Adirondack lake watersheds, New York, 6:26269 (CONF-800365—)
Muon Reactions
Shadowing in muon-nucleus scattering, 6:26483
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
Toxicity
Effect of calcium on the toxicity of zinc and lead compounds in the water medium, 6:26362 (CONF-800365—)
Environmental contaminants in food. Volume II-Part B: Working papers, 6:26199 (PB—81-116774)
LEAD 208
Energy Levels
Threshold photoneutron angular distribution and polarization studies of nuclei, 6:26591 (CONF-801111—48)
LEAD 208 TARGET
Electron Reactions
Mesonic processes in deep-inelastic electron scattering from nuclei, 6:26607
Photonuclear Reactions
Threshold photoneutron angular distribution and polarization studies of nuclei, 6:26591 (CONF-801111—48)
LEAD 210
Environmental Exposure Pathway
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
Radioecological Concentration
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
LEAD IONS
Ion-Ion Collisions
Theory of positron production in heavy-ion collisions, 6:26466
LEAD METHOD
See ISOTOPE DATING
LEAD-ACID BATTERIES
Performance
Progress and forecast in electric-vehicle batteries, 6:25878 (CONF-800939—2)
Recombiners
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells. Final report (Hydrogen-oxygen gas recombination device), 6:25583 (ANL/OEPM—80-8)
Research Programs
Near-term batteries for electric vehicles, 6:25586 (CONF-810315—13)
LEAD-FREE GASOLINE
See UNLEADED GASOLINE
LEASING
Government Policies
Outer-continental shelf oil and gas leasing policy, 6:25041 (DOE/PE/70278—T14)
Recommendations
Outer-continental shelf oil and gas leasing policy, 6:25041 (DOE/PE/70278—T14)
LEAVES
Ion Exchange
Collection and retention of atmospheric pollutants by vegetation, 6:26333 (CONF-800365—)
Nutrients
Effects of acid precipitation on soil and forest. 8. Foliar nutrient concentrations in field experiments, 6:26355 (CONF-800365—)
LEDGEMONT PROCESS
Comparative Evaluations
Evaluation of chemical coal cleaning processes, 6:24954
LEPTONS
See also ELECTRONS
MUONS
NEUTRINOS
Pair Production
Same-sign dilepton puzzle, 6:26527
Two-photon results from SPEAR, 6:26512
LIGHT PIPES
Temperature Distribution
Measurement of peak temperature along an optical fiber, 6:26087 (DOE/TIC—1023186)
LIGHT SOURCES
Brightness
Tunable, ultrahigh-spectral-brightness ArF* excimer laser source, 6:26037

LIGNIN
Catagenesis
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
Oxidation
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
Structural Chemical Analysis
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
LIGNITE
Catagenesis
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
Chemical Composition
Lignite combustion test project summary report. Test L-115, 6:24957 (DOE/FC/02030—T1)
Oxidation
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
Pyrolysis
Kinetics of lignite pyrolysis in an entrained-flow, isothermal furnace, 6:24886
Pyrolysis of blocks of lignite, 6:24890
Resource Assessment
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)
Structural Chemical Analysis
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
LIME-SODA SINTER PROCESS
Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980, 6:24929 (IS—4773)
LIMESTONE
Activation Analysis
Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)
Physicochemical characterizations of limestone for fluidized-bed coal combustion, 6:24964 (ORNL/TM—7292)
Chemical Composition
Lignite combustion test project summary report. Test L-115, 6:24957 (DOE/FC/02030—T1)
Comparative Evaluations
Physicochemical characterizations of limestone for fluidized-bed coal combustion, 6:24964 (ORNL/TM—7292)
Petrography
Physicochemical characterizations of limestone for fluidized-bed coal combustion, 6:24964 (ORNL/TM—7292)
Radionuclide Migration
Fracture flow modeling for low-level nuclear waste disposal, 6:25114 (CONF-801217—)
Sorptive Properties
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)
Methods of improving limestone utilization in FBC, 6:24955 (CONF-800806—44)
Surface Area
Physicochemical characterizations of limestone for fluidized-bed coal combustion, 6:24964 (ORNL/TM—7292)
X-Ray Diffraction
Physicochemical characterizations of limestone for fluidized-bed coal combustion, 6:24964 (ORNL/TM—7292)
X-Ray Fluorescence Analysis
Physicochemical characterizations of limestone for fluidized-bed coal combustion, 6:24964 (ORNL/TM—7292)
LIMITERS
Steady-state tokamak reactor with non-divertor impurity control: STARFIRE, 6:26669 (CONF-800950—20)
Design
Limiter/vacuum system for plasma impurity control and exhaust in tokamaks, 6:26681 (CONF-801011—96)
Maintenance
In-situ maintenance of low-Z limiters in reactors, 6:26683 (CONF-801011—99)
LINACS
See LINEAR ACCELERATORS
LINEAR ACCELERATORS
Beam Injection
Argonne tandem as injector to a superconducting linac, 6:26064 (CONF-8006123—3)
Beam Optics
Argonne tandem as injector to a superconducting linac, 6:26064 (CONF-8006123—3)
Electron Beams
Characterization of an accelerator designed to study electron-beam uniformity in large diodes, 6:26072 (SAND—81-0844C)
Kilo Amp Beam Currents
Characterization of an accelerator designed to study electron-beam uniformity in large diodes, 6:26072 (SAND—81-0844C)
Magnetic Analyzers
Six tesla analyzing magnet for heavy-ion beam transport, 6:26067 (CONF-800980—39)
LINEAR SCREW PINCH DEVICES
Stabilization
Finite ion Larmor radius stabilization of m = 1 modes of a high-β screw pinch, 6:26651
LINEAR Z PINCH DEVICES
Rotation
Analytic solution for a weakly rotating, collisionless z pinch, 6:26654
LINERS
Laser Implosions
Diffusion of magnetic field into an expanding plasma shell, 6:26660
LIOUVILLE EQUATION
See BOLTZMANN-VLASOV EQUATION
LIQUEFIED NATURAL GAS
Combustion
Flame propagation in gaseous fuel mixtures in semiconfined geometries, 6:25079 (UCID—19000)
Gelation
Study of gelled LNG, 6:25078 (DOE/TIC—11452)
Ignition
Initiation of detonation in unconfined natural gas-air clouds. Final report, 6:25071 (PB—81-113292)
Leaks
Study of gelled LNG, 6:25078 (DOE/TIC—11452)
Rheology
Study of gelled LNG, 6:25078 (DOE/TIC—11452)
Shear
Study of gelled LNG, 6:25078 (DOE/TIC—11452)
Strain Rate
Study of gelled LNG, 6:25078 (DOE/TIC—11452)
LIQUEFIERS
See CONDENSERS
LIQUID ASPHALT
See RESIDUAL FUELS
LIQUID FUELS
Synthesis
Hybrid biothermal conversion of biomass to liquid fuels, 6:25194
LIQUID METAL FAST BREEDER REACTORS
See LMFBR TYPE REACTORS
LIQUID METAL TEST FACILITIES
See TEST FACILITIES
LIQUID WASTES
See also WASTE WATER
Heat Transfer
WHC: a multi-dimensional model of water movement, heat flow, and chemical transport in complex aquifer systems, 6:26287 (ORNL/TM—7564)

Liquid Flow
WHC: a multi-dimensional model of water movement, heat flow, and chemical transport in complex aquifer systems, 6:26287 (ORNL/TM—7564)
Mass Transfer
WHC: a multi-dimensional model of water movement, heat flow, and chemical transport in complex aquifer systems, 6:26287 (ORNL/TM—7564)

LIQUID-METAL MHD GENERATORS
Efficiency
Liquid-metal MHD for solar and coal, 6:25646 (CONF-800617—8)
Feasibility Studies
Liquid-metal MHD for solar and coal, 6:25646 (CONF-800617—8)
Liquid-metal MHD for solar and coal: system and component status, 6:25648 (CONF-800806—42)

LIQUIDS
Interfaces
Overview of current status of solid/liquid interface science, 6:25238 (CONF-8006156—)

LITHIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Ion Collisions
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)

LITHIUM 6 TARGET
Deuteron Reactions
Nuclear cross sections for light ions on ^6Li (100 keV to several MeV), 6:26577 (CONF-801111—47)
Helium 3 Reactions
Nuclear cross sections for light ions on ^6Li (100 keV to several MeV), 6:26577 (CONF-801111—47)
Pion Reactions
Inclusive reactions of pions on nuclei, 6:26575
Proton Reactions
Nuclear cross sections for light ions on ^6Li (100 keV to several MeV), 6:26577 (CONF-801111—47)

LITHIUM 7 REACTIONS
Stripping
Strong j-dependent effects in (^7Li, ^6Li) reactions, 6:26582

LITHIUM COMPOUNDS
Electric Conductivity
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Recrystallization
Crystallographic properties of lithium niobate shock-loaded from 3.7 to 20 GPa and preserved for post-shock study, 6:25952 (SAND—81-1315C)
Thermodynamic Properties
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Viscosity
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)

LITHIUM FLUORIDES
Chemical Reactions
Laser-collision induced chemical reactions: A comparison of quantum mechanical and classical model results, 6:25999
Latent Heat Storage
High-temperature phase change thermal storage, 6:25766 (CONF-800272—)

LITHIUM HYDROXIDES
Latent Heat Storage
High-temperature phase change thermal storage, 6:25766 (CONF-800272—)

LITHIUM SULFIDES
Phase Diagrams
Phase relationships in positive electrodes of high-temperature lithium aluminum/iron sulfide cells, 6:25587 (CONF-8010159—11)

LITHIUM-SULFUR BATTERIES
Cathodes
Phase relationships in positive electrodes of high-temperature lithium aluminum/iron sulfide cells, 6:25587 (CONF-8010159—11)
Performance
Recent progress in lithium/iron sulfide battery development, 6:25585 (CONF-800806—46)
Thermal Insulation
Recent progress in lithium/iron sulfide battery development, 6:25585 (CONF-800806—46)
Waste Disposal
Testing of lithium-sulfur dioxide cells for waste disposal hazards. Final report sep 79-mar 80, 6:25582 (AD—A-090785)

LMFBR TYPE REACTORS
See also CLINCH RIVER BREEDER REACTOR
EBR-2 REACTOR
PHENIX REACTOR
After-Heat Removal
Calculational method for combined natural circulation and forced-convection flow in a channel, 6:25518 (CONF-800723—26)
Study of turbulent natural-circulation flow and low-Prandtl-number forced-convection flow, 6:25519 (CONF-800723—27)
Containment Systems
Permeation cascades for the separation of krypton and xenon from nuclear reactor atmospheres, 6:25567
Coolant Cleanup Systems
Design criteria and candidate concept for high-performance cold trap, 6:25491 (DOE/SF/00893—T4)
Decontamination
Decontamination of LMFBR components: report of FY 1979 results (GCA process), 6:25493 (DOE/SF/76026—T7)
Fuel Assemblies
Two-dimensional computational modeling of sodium boiling in simulated LMFBR fuel-pin bundles, 6:25521 (CONF-810606—54)
Fuel Element Failure
Breached-pin testing in the US, 6:25495 (HEDL-SA—2405-FP)
Fuel-Coolant Interactions
Breached-pin testing in the US, 6:25495 (HEDL-SA—2405-FP)
Loss of Flow
Study of turbulent natural-circulation flow and low-Prandtl-number forced-convection flow, 6:25519 (CONF-800723—27)
Molten Metal-Water Reactions
Plan for support of large-plant (post-CRBR) needs in large-leak sodium-water reaction area, 6:25523 (DOE/SF/70030—T19)
Reactor Accidents
Differential sensitivity theory applied to movement of maxima responses, 6:25520 (CONF-810606—42)
Importance theory for lumped-parameter systems, 6:25526 (HEDL-SA—2329-FP)
Two-dimensional computational modeling of sodium boiling in simulated LMFBR fuel-pin bundles, 6:25521 (CONF-810606—54)
Reactor Core Disruption
Analysis of thermal conductivity probes for high temperature applications, 6:25537 (SAND—81-0106)
Reactor Materials
Analysis of thermal conductivity probes for high temperature applications, 6:25537 (SAND—81-0106)
Response to annealing and reirradiation of AISI 304L stainless steel following initial high-dose neutron irradiation in EBR-II, 6:25488 (CONF-800609—17)
Reactor Safety
Calculational method for combined natural circulation and forced-convection flow in a channel, 6:25518 (CONF-800723—26)

LNG
See LIQUEFIED NATURAL GAS

LOFT REACTOR
Loss of Coolant
TRAC-PD2 modeling of LOFT and PWR small cold-leg breaks, 6:25531 (LA-UR—81-1521)

LOSS CONE INSTABILITY
Dispersion Relations
Effects of the fast wave on the drift-cyclotron loss-cone mode, 6:26653
Interaction of lower hybrid wave fields with drift-cyclotron loss-cone instability, 6:26652
LOSS OF COOLANT
Heat Transfer
Comparisons of TRAC-PD2 calculations with Semiscale Mod-3 small-break tests (PWR), 6:25530 (LA-UR—81-1520)
Pretest and posttest calculations of Semiscale Test S-07-10D with the TRAC computer program (PWR), 6:25532 (LA-UR—81-1556)
Special small-break applications with TRAC (PWR), 6:25529 (LA-UR—81-1519)
TRAC methods and models (PWR), 6:25528 (LA-UR—81-1498)
TRAC-PD2 modeling of LOFT and PWR small cold-leg breaks, 6:25531 (LA-UR—81-1521)
Hydraulics
Comparisons of TRAC-PD2 calculations with Semiscale Mod-3 small-break tests (PWR), 6:25530 (LA-UR—81-1520)
Pretest and posttest calculations of Semiscale Test S-07-10D with the TRAC computer program (PWR), 6:25532 (LA-UR—81-1556)
Special small-break applications with TRAC (PWR), 6:25529 (LA-UR—81-1519)
TRAC methods and models (PWR), 6:25528 (LA-UR—81-1498)
TRAC-PD2 modeling of LOFT and PWR small cold-leg breaks, 6:25531 (LA-UR—81-1521)
Temperature Gradients
Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region (PWR; BWR), 6:25522 (CONF-810801—3(Summ.))
LOSS OF FLOW
Heat Transfer
Study of turbulent natural-circulation flow and low-Prandtl-number forced-convection flow (LMFBR), 6:25519 (CONF-800723—27)
Hydraulics
Study of turbulent natural-circulation flow and low-Prandtl-number forced-convection flow (LMFBR), 6:25519 (CONF-800723—27)
LOSS OF FLUID TEST REACTOR
See LOFT REACTOR
LUBRICATING OILS
See also WASTE OILS
Performance
Automotive fuel economy: potential improvement through selected differential gear lubricants, 6:25857 (DOE/BETC/IC—80/3(Vol.4))
Automotive fuel economy: potential improvement through selected engine lubricants, 6:25858 (DOE/BETC/IC—80/3(Vol.4))
Recycling
Application of the BETC re-refining technology to some state-of-the-art commercial lube oils, 6:25046 (DOE/BETC/RI—81/1)
Enhanced utilization of used lubricating oil recycling process by-products, 6:25044 (DOE/BETC/IC—80/3(Vol.4))
Processi.g and utilization. Annual report, October 1, 1979-September 30, 1980, 6:25054 (DOE/BETC/IC—80/3(Vol.4))
Used oil recycling (Solvent treatment/distillation rerefining), 6:25043 (DOE/BETC/IC—80/3(Vol.4))
LUMBER INDUSTRY
See WOOD PRODUCTS INDUSTRY
LURGI SLAGGING PROCESS
By-Products
Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 2. overall plant, 6:24843 (DOE/ET/13060—T3(Vol.2))
Demonstration Plants
Demonstration plant engineering and design. Phase I: the pipeline gas demonstration plant. Volume 7. Plant Section 500 - shift/methanation, 6:24845 (DOE/ET/13060—T3(Vol.7))
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))
Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 2, overall plant, 6:24843 (DOE/ET/13060—T3(Vol.2))
Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 13. Plant Section 1200, Phenol Extraction, 6:24847 (DOE/ET/13060—T3(Vol.13))
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))
Raw Materials
Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 2, overall plant, 6:24843 (DOE/ET/13060—T3(Vol.2))
Waste Water
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))
Water Requirements
Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 2, overall plant, 6:24843 (DOE/ET/13060—T3(Vol.2))
LYMPHOBLASTOMAS
See LYMPHOMAS
LYMPHOGRANULOMAS
See LYMPHOMAS
LYMPHOMAS
Immunology
Human T-cell lymphoma with suppressor effects on the mixed lymphocyte reaction (MLR). I. Morphological and cytogenetic analysis, 6:26305
LYOLUMINESCENCE
Uses
Applications of lyoluminescence, 6:26085

M

MACHINE PARTS
See also MECHANICAL TRANSMISSIONS
Electrochemical Machining
Electrochemical deburring, 6:26014 (BDX—613-2594)
Failure Mode Analysis
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Machining
Training manual for precision hand deburring, Part 4, 6:26013 (BDX—613-2582)
Reliability
Development and validation of reliability forecast techniques for selected thermomechanical components of gas turbine combined-cycle plants. Final report, 6:25441 (EPRI-AP—1849)
Surface Finishing
Training manual for precision hand deburring, Part 4, 6:26013 (BDX—613-2582)
MACHINE TOOLS
See also LATHES
On-Line Control Systems
PTTOPT APT postprocessor, 6:26015 (BDX—613-2634)
MACHINING
Training manual for precision hand deburring, Part 4, 6:26013 (BDX—613-2582)
MAGNESIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)

Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
MAGNESIUM 26 TARGET
Pion Plus Reactions
Elastic pion double charge exchange reactions, 6:26578
MAGNESIUM COMPOUNDS
Chemical Reactions
Improved efficiency in the sulfur dioxide-iodine hydrogen cycle through the use of magnesium oxide, 6:25177 (LA-UR—81-1050)
MAGNESIUM FLUORIDES
Latent Heat Storage
High-temperature phase change thermal storage, 6:25766 (CONF-800272—)
MAGNESIUM OXIDES
Chemical Reactions
Improved efficiency in the sulfur dioxide-iodine hydrogen cycle through the use of magnesium oxide, 6:25177 (LA-UR—81-1050)
Grain Boundaries
Energies of <110> coincidence twist boundaries, stacking faults, and free surfaces in metal oxides with NaCl structure, 6:26613 (CONF-800765—9)
Hydration
Hydration of spent limestone and dolomite to enhance sulfation in fluidized-bed combustion, 6:24956 (CONF-800806—45)
Physical Radiation Effects
Special Purpose Materials annual progress report, October 1, 1979, 6:25902 (DOE/ER—0048/1)
Stacking Faults
Energies of <110> coincidence twist boundaries, stacking faults, and free surfaces in metal oxides with NaCl structure, 6:26613 (CONF-800765—9)
MAGNET COILS
Design
Resistive demountable toroidal-field coils for tokamak reactors, 6:26705 (PPPL—1809)
Stress Analysis
Permissible-limit and flaw-size determination in an experimental fusion-reactor component, 6:26693 (GA-A—14847)
MAGNETIC ANALYZERS
Superconducting Magnets
Six tesla analyzing magnet for heavy-ion beam transport, 6:26067 (CONF-800980—39)
MAGNETIC BREMSSTRAHLUNG
See SYNCHROTRON RADIATION
MAGNETIC COILS
See MAGNET COILS
MAGNETIC ENERGY STORAGE
Superconducting Coils
Superconducting solenoid designed for 400 kJ at 25 kA under conditions of fast discharge and field reversal, 6:26695 (LA—8829-MS)
MAGNETIC MIRROR CONFIGURATIONS
Electron Temperature
Critical analysis of the electron gyrorelaxation heating device in the AMBAL facility, 6:26663 (UCRL-Trans—11689)
MAGNETIC MIRRORS
See also MFTF DEVICES
TMX DEVICES
2X DEVICES
Ballooning Instability
Kinetic effects on ballooning modes in mirror machines, 6:26655
Cyclotron Instability
Effects of the fast wave on the drift-cyclotron loss-cone mode, 6:26653
Drift Instability
Effects of the fast wave on the drift-cyclotron loss-cone mode, 6:26653
Equilibrium
Analytic equilibria with quadrupole symmetry in the paraxial limit, 6:26657
Loss Cone Instability
Effects of the fast wave on the drift-cyclotron loss-cone mode, 6:26653
Plasma Drift
Drift modes in axisymmetric tandem mirrors, 6:26649
Plasma Pressure
Analytic equilibria with quadrupole symmetry in the paraxial limit, 6:26657
Viscous Flow
Viscous plasma flow in a multiple-mirror configuration, 6:26656
MAGNETIC PROBES
Design
Internal magnetic probe data from ZT-40, 6:26694 (LA—8753MS)
MAGNETIC REFRIGERATORS
Materials for magnetic refrigeration between 2 and 20 K, 6:25949 (LA—8746-MS)
MAGNETIC SPECTROMETERS
Performance
Results from TASSO, 6:26086
Solenoids
Superconducting compensator magnets to be used with the HRS spectrometer at the SLAC PEP facility, 6:26068 (CONF-800980—42)
Superconducting Magnets
Superconducting compensator magnets to be used with the HRS spectrometer at the SLAC PEP facility, 6:26068 (CONF-800980—42)
MAGNETOHYDRODYNAMIC CHANNELS
See MHD CHANNELS
MAGNETOHYDRODYNAMIC GENERATORS
See MHD GENERATORS
MAGNETOSPHERE
Boundary Layers
Structure of the low-latitude boundary layer, 6:26441
Morphology
Structure of the low-latitude boundary layer, 6:26441
Plasma Sheet
Substorm-related plasma sheet motions as determined from differential timing of plasma changes at the Isee satellites, 6:26439
MAINE
Wind Power
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)
MAIZE
Biothermohol Process
Hybrid biothermal conversion of biomass to liquid fuels, 6:25194
Drying
Development of a concentric-vortex agricultural-residue furnace, 6:25277
Harvesting
Economic and energy analysis of potential corn-residue harvesting systems, 6:25276
MALIGNANCIES
See NEOPLASMS
MALONIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908
MANGANESE
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Environmental Transport
Comparison of lead, manganese, and zinc transport in three Adirondack lake watersheds, New York, 6:26269 (CONF-800365—)

Geochemistry
Conversion of dissolved manganese to particulate manganese during diatom bloom: effects of the manganese cycle in the MERL microcosms, 6:26245

MANGANESE ALLOYS
Hyperfine Structure
Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ under extermal magnetic fields, 6:25897 (CONF-801134—16)

MANUFACTURERS
Energy Conservation
Project Monitor: Part II. Conservation in small business: an exploratory study. Final report, 6:25718 (DOE/CS/10220—T1)

MANUFACTURING FACILITIES
See INDUSTRIAL PLANTS

MANURES
Anaerobic Digestion
Kelley Hot Spring Geothermal Project: Kelly Hot Spring Agricultural Center conceptual design, 6:25409 (GT—27041-4)

MANY-BODY PROBLEM
Moments Method
Applications of moment methods to finite nuclei, 6:26603 (IS-M—320)

MAPS
Coloration
Theory for coloring bivariate statistical maps, 6:26733 (DOE/EV/10428—9)

MARCOULE PHENIX REACTOR
See PHENIX REACTOR

MARICULTURE
See AQUACULTURE

MARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS

MARKET
See also COMMERCIALIZATION
Technology Transfer
Multimarket, multitechnology, multiattribute technological forecasting, 6:25611

MARKET SHARES
See MARKET

MARKETERS
See also RETAILERS
Profits
Reducing the impact of margin ceilings on gasoline wholesalers. Final report, 6:25042 (PB—81-117160)

MARLSTONE
Fractures
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Permeability
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Porosity
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)

MARYLAND
Demography
Land use and development trends in Dorchester and Wicomico counties, 6:25464 (PB—81-110249)
Geological Surveys
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 6. Site investigation: shallow drilling. Final report, 6:25568 (EPRI-EM—1589(Vol.6))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 7. Site investigation: deep drilling. Final report, 6:25569 (EPRI-EM—1589(Vol.7))
Land Use
Land use and development trends in Dorchester and Wicomico counties, 6:25464 (PB—81-110249)
Wind Power
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)

MASS SPECTROSCOPY
Cyclotrons
Mass spectrometry with a very small cyclotron, 6:26071 (LBL—12797)
Sample Preparation
Accelerator mass spectrometry and radioisotope detection at the Argonne FN tandem facility, 6:26070 (CONF-8006123—2)

MASS TRANSFER
Computer Codes
Computer program CCC: user's manual, 6:26475 (LBL—10909)
Computerized Simulation
Computer program CCC: user's manual, 6:26475 (LBL—10909)
Mathematical Models
Modeling of water and solute transport under variably saturated conditions: state of the art (347 references), 6:25112 (CONF-801217—)

MASSACHUSETTS
Resource Recovery Facilities
Raytheon Service Company experience and programs in resource recovery, 6:26057 (ANL/CNSV-TM—60)
Wind Power
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)

MASSIVE VECTOR MESON MODEL
See GLUON MODEL

MATERIALS RECOVERY
Municipal Wastes
Resouce recovery option in solid-waste management: a review guide for public officials , 6:25839 (DOE/CS/20156—T1)

MATHEMATICAL LOGIC
Automation
Hyperparamodulation: a refinement of paramodulation, 6:26626 (CONF-8007106—1)

MATHEMATICAL MODELS
See also ATOMIC MODELS
FLOW MODELS
MOLECULAR MODELS
Verification of partially saturated zone moisture migration: model and field facilities, 6:25113 (CONF-801217—)
Comparative Evaluations
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume I. Dispersion from single and multiple source natural draft cooling towers. Technical report, 6:25459 (NUREG/CR—1581-V-1)
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 2. Salt drift deposition from natural draft cooling towers. Technical report, 6:25460 (NUREG/CR—1581-V-2)
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 3. Plume rise from mechanical draft cooling towers. Technical report, 6:25461 (NUREG/CR—1581-V-3)
Response Modifying Factors
Causes of CO_2-induced sensitivity in a zonal climate model, 6:26163 (UCRL—85754)
Reviews
Development and application of terrestrial food chain models to assess health risks to man and releases of pollutants to the environment, 6:26192 (IAEA-SM—254/63)

MEASURING INSTRUMENTS
See also DOSEMETERS
FLOWMETERS
GAS METERS
INTERFEROMETERS
RADIATION DETECTORS
RADIATION MONITORS
RADIOMETRIC GAGES
SEISMIC ARRAYS
SPECTROMETERS
STRAIN GAGES
THERMOCOUPLES
Design
Lightpipe luminoscope for monitoring occupational skin contamination, 6:26094

MEAT INDUSTRY
Energy Conservation
Production of beef with minimum grain and fossil energy inputs. Volume III. Input forms for the model. Final report, 6:25805 (PB—81-113706)

MECHANICAL DRAFT COOLING TOWERS
Plumes
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 3. Plume rise from mechanical draft cooling towers. Technical report, 6:25461 (NUREG/CR—1581-V-3)
MECHANICAL TRANSMISSIONS
Lubricating Oils
Automotive fuel economy: potential improvement through selected differential gear lubricants, 6:25857 (DOE/BETC/IC—80/3(Vol.4))
MELLITIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908
MELTDOWN
Chemical Reactions
Light water reactor safety research program. Quarterly report Jan-Mar 80, 6:25535 (NUREG/CR—1509)
MEMORY DEVICES
Performance
FASTBUS introduction and demonstration, 6:26090 (SLAC-PUB—2738)
Specifications
FASTBUS introduction and demonstration, 6:26090 (SLAC-PUB—2738)
MERCURY
Biochemical Reaction Kinetics
Heavy-metal and nutrients effects on sediment oxygen demand in three-phase aquatic microcosms, 6:26224
Environmental Transport
Metal tracers in two marine microcosms: sensitivity to scale and configuration, 6:26290
Toxicity
Environmental contaminants in food. Volume II-Part B: Working papers, 6:26199 (PB—81-116774)
MERCURY COMPOUNDS
Deposition
Role of clouds in atmospheric transport of mercury and other pollutants: 1. The link between acid precipitation, poorly buffered waters, mercury and fish. 2. The role of cloud water in atmospheric transport, 6:26133 (CONF-800365—)
MERCURY FLUORIDES
Crystal Structure
Fluctuations and freezing in a one-dimensional liquid: Hg/sub 3-δ/AsF6, 6:26617
MESIC ATOMS
Production
Diabatic-state treatment of negative-meson moderation and capture. I. The hydrogen atom, 6:26464
MESOATOMS
See MESIC ATOMS
MESONS
M1-Transitions
Magnetic moments of quarks in baryons and mesons, 6:26510
Radiative Decay
Magnetic moments of quarks in baryons and mesons, 6:26510
METABOLISM
Pathological Changes
Physiological responses to acid water in fish. 2. Effects of acid water on metabolism and gill ventilation in brown trout, Salmo trutta L., and brook trout, Salvelinus fontinalis Mitchill, 6:26384 (CONF-800365—)
METAL INDUSTRY
Energy Conservation
Energy conservation at the Nippon Steel Corporation, 6:25790 (CONF-7910214—)
Energy savings through the use of an improved aluminum reduction-cell cathode. Technical progress report, April 1, 1980-June 30, 1980, 6:25796 (DOE/CS/40215—T1)
Energy Consumption
Energy conservation at the Nippon Steel Corporation, 6:25790 (CONF-7910214—)
Energy Recovery
Oxygen-converter gas recovery, 6:25770 (CONF-800272—)
Heat Storage
Industrial thermal-storage applications, 6:25765 (CONF-800272—)
METALS
See also RARE EARTHS
Biological Effects
Report to the Congress on ocean pollution and offshore development, October 1977 through September 1978. Annual report No. 6, 6:26298 (PB—81-118333)
Deformation
Deformation microstructures and mechanical equations of state, 6:25898 (CONF-801148—6)
Deposition
Atmospheric deposition of trace elements in Norway, 6:26124 (CONF-800365—)
Contribution from long-range atmospheric transport to the heavy metal pollution of surface soil, 6:26119 (CONF-800365—)
Dielectric Properties
Semiclassical image potential at a solid surface, 6:26616
Environmental Transport
Fallout, distribution and some effects of Zn, Cd, Pb, Cu and As in aquatic ecosystems near a base metal smelter on Canada's Precambrian Shield, 6:26366 (CONF-800365—)
Fracture Properties
Development of fracture toughness measurement capability by ultrasound. Final report, 6:26044 (BDX—613-2625)
Fragment-size prediction in dynamic fragmentation, 6:25911 (SAND—80-2800C)
Fragmentation
Fragment-size prediction in dynamic fragmentation, 6:25911 (SAND—80-2800C)
Melting
Nonconsumable arc melting furnace, 6:26024 (SAND—81-0810)
Microstructure
Deformation microstructures and mechanical equations of state, 6:25898 (CONF-801148—6)
Physical Radiation Effects
Comparison of fission fragment damage with fast neutron damage in metals, 6:25931
Plasmons
Semiclassical image potential at a solid surface, 6:26616
Toxicity
Fallout, distribution and some effects of Zn, Cd, Pb, Cu and As in aquatic ecosystems near a base metal smelter on Canada's Precambrian Shield, 6:26366 (CONF-800365—)
Ultrasonic Testing
Development of fracture toughness measurement capability by ultrasound. Final report, 6:26044 (BDX—613-2625)
METEOROLOGY
See also WEATHER
Data Acquisition
On-site quality control of insolation measurements, 6:25227
Monitoring
Diffuse sky measurements and determination of corrected shadow band multiplication factors, 6:25228
Research Programs
Solar-meteorological research program for the South-Central US, 6:25226
METHACRYLIC ACID ESTERS
Rheology
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
Synthesis
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
Viscosity
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
METHANATION
Catalysts
Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal, 6:24892

Development of catalysts for coal conversion. Annual report for 1979, 6:24871 (PB—81-111395)
Evaluation of coal conversion catalysts. Annual report, 6:24870 (PB—81-111387)
Comparative Evaluations
Engineering economic analysis of biomethanation of pyrolysis gas, 6:25181 (DOE/CE/20098—1)
Economic Analysis
Engineering economic analysis of biomethanation of pyrolysis gas, 6:25181 (DOE/CE/20098—1)
Feasibility Studies
Engineering economic analysis of biomethanation of pyrolysis gas, 6:25181 (DOE/CE/20098—1)
METHANE
Performance of a CFR engine burning simulated anaerobic digester's gas, 6:25893
Biosynthesis
Engineering economic analysis of biomethanation of pyrolysis gas, 6:25181 (DOE/CE/20098—1)
Enhancement of methane gas production using an industrial waste in anaerobic digestion, 6:25179 (CONF-801210—26)
Main research topics in the Department of Waste Management of the University of Stuttgart and a report on current investigations of practical interest concerning landfill gas, 6:25180 (CONF-7909198—)
Refuse conversion to methane (RefCOM): a proof-of-concept anaerobic digestion facility, 6:25187
Production
Feasibility study: utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamas County, Oregon, 6:25892 (DOE/RA/50366—T1)
Land biomass program. Annual report 1 Apr-31 Dec 79, 6:25254 (PB—81-113177)
Marine biomass program. Annual report 1 Jan-31 Dec 79, 6:25255 (PB—81-113185)
Recovery
Alleviation of environmental problems of waste disposal with production of energy and carbon dioxide, 6:25820
Demonstration project for methane recovery from deep coal seams, 6:24944
Evaluation of gas-bearing coal seams, 6:25070
METHANOL
Regeneration
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))
Synthesis
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)
METHANOL FUELS
Evaporation
Evaporative emissions from vehicles operating on methanol/gasoline blends, 6:25889 (DOE/BETC/IC—80/3(Vol.4))
Fleet trials using methanol/gasoline blends, 6:25890 (DOE/BETC/IC—80/3(Vol.4))
Performance
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))
METHYLBENZENE
See TOLUENE
METHYLENE BLUE
Photolysis
Disproportionation of semimethylene blue and oxidation of leucomethylene blue by methylene blue and by Fe(III). Kinetics, equilibria, and medium effects, 6:26001
Redox Reactions
Disproportionation of semimethylene blue and oxidation of leucomethylene blue by methylene blue and by Fe(III). Kinetics, equilibria, and medium effects, 6:26001
2-METHYLPROPANOL
Dielectric Properties
Dielectric relaxation of oil-external microemulsions, 6:25994
Phase Studies
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))
MFTF DEVICES
Distribution Functions
Electron-cyclotron-resonant-heated electron distribution functions, 6:26645 (UCRL—85826)
MHD CHANNELS
Design
MHD channel study for the ETF conceptual design, 6:25651 (DOE/NASA/10769—14)
Testing
US/USSR joint MHD generator testing at the U-25 MHD pilot plant, 6:25649 (CONF-800806—43)
MHD GENERATOR CFFF
Superconducting Magnets
Design and construction of a large superconducting MHD magnet for the Coal-Fired Flow Facility at the University of Tennessee Space Institute, 6:25647 (CONF-800631—10)
MHD GENERATOR ETF
MHD Channels
MHD channel study for the ETF conceptual design, 6:25651 (DOE/NASA/10769—14)
MHD GENERATOR U-25
MHD Channels
US/USSR joint MHD generator testing at the U-25 MHD pilot plant, 6:25649 (CONF-800806—43)
Superconducting Magnets
US/USSR joint MHD generator testing at the U-25 MHD pilot plant, 6:25649 (CONF-800806—43)
Testing
US/USSR joint MHD generator testing at the U-25 MHD pilot plant, 6:25649 (CONF-800806—43)
MHD GENERATORS
See also COAL-FIRED MHD GENERATORS
LIQUID-METAL MHD GENERATORS
MHD GENERATOR U-25
Diffusers
Subsonic diffusers for MHD generators, 6:25653
Electrodes
Method for manufacturing magnetohydrodynamic electrodes (Patent), 6:25655
Research Programs
MHD/steam electrical power production-a status report, 6:25656
MHD POWER PLANTS
See also MHD GENERATOR ETF
Design
Method of generating electricity using an endothermic coal gasifier and MHD generator (Patent), 6:25654
Feasibility Studies
Open-cycle MHD technology status and development perspective: operational analysis of open-cycle MHD, 6:25652 (EPRI-AP—1864)
MICELLAR-POLYMER FLOODING
See MICROEMULSION FLOODING
MICHIGAN
Acid Rain
Susceptibility of aquatic and terrestrial resources of Minnesota, Wisconsin, and Michigan to impacts from acid precipitation: informational requirements, 6:26122 (CONF-800365—)
Regional Analysis
Susceptibility of aquatic and terrestrial resources of Minnesota, Wisconsin, and Michigan to impacts from acid precipitation: informational requirements, 6:26122 (CONF-800365—)
Wind Power
Techniques for assessing the wind energy resource in the Great Lakes region, 6:25415 (PNL—3668)
MICROBIAL EOR
In situ microbial enhancement of oil production by biopolymer or biosurfactant production or selective plugging, 6:24991 (DOE/BETC/IC—80/3(Vol.1))
MICROBIAL FLORA
See MICROORGANISMS
MICROCOSMS
Design
Microcosms in ecological modeling, 6:26217
Some cautions in applying results from aquatic microcosms, 6:26218
Synthesizing aquatic microcosms, 6:26215

Types of aquatic microcosms and their research applications, 6:26222
Use of microcosms in studying decomposition processes in sewage sludge, 6:26231
Evaluation
Are microcosms useful for ecosystem analysis, 6:26226
Chemical evaluation: projected application of terrestrial microcosm technology, 6:26179
In situ continuous culturing of lake phytoplankton communities, 6:26233
Laboratory aquatic microcosms, 6:26229
Large-scale microcosms for assessing fates and effects of trace contaminants, 6:26221
Limitations on the use of microcosms for predicting algal response to nutrient enrichment in lotic systems, 6:26239
Mineral Cycling
Conversion of dissolved manganese to particulate manganese during diatom bloom: effects of the manganese cycle in the MERL microcosms, 6:26245
Optimization
Making microcosms an effective assessment tool, 6:26216
Uses
Marine microcosms in ecological research, 6:26240
Microcosms in ecological research, 6:26212
MICROEMULSION FLOODING
Field Tests
Commercial scale demonstration of the Maraflood process: M-1 project, Crawford County, Illinois, 1979-1980, 6:25010 (DOE/BETC/IC—80/3(Vol.2))
Improved oil recovery by micellar-polymer flooding El Dorado, Kansas, field, 6:25004 (DOE/BETC/IC—80/3(Vol.2))
Micellar-polymer joint demonstration project, Wilmington Field, California, 6:25006 (DOE/BETC/IC—80/3(Vol.2))
Micellar-polymer oil recovery demonstration in the Bell Creek Field, Montana, 6:25009 (DOE/BETC/IC—80/3(Vol.2))
North Burbank Unit tertiary recovery pilot test, 6:25012 (DOE/BETC/IC—80/3(Vol.2))
Penn Grade Micellar Displacement Project, 6:25011 (DOE/BETC/IC—80/3(Vol.2))
Residual oil saturation determination Wilmington micellar-polymer project, October, 1979-October, 1980, 6:24981 (DOE/BETC/IC—80/3(Vol.1))
Research Programs
Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980, 6:25033 (DOE/BETC/OR—19)
Site Selection
Selection of reservoirs amenable to micellar flooding (Mid-continent and California regions), 6:24983 (DOE/BETC/IC—80/3(Vol.1))
MICROEMULSIONS
Rheology
New concepts for enhancing petroleum recovery, 6:25025 (DOE/BETC/IC—80/3(Vol.2))
Ultracentrifugation
Studies of aqueous solutions and microemulsions for enhanced oil recovery processes, 6:25053 (DOE/BETC/IC—80/3(Vol.2))
Viscosity
New concepts for enhancing petroleum recovery, 6:25025 (DOE/BETC/IC—80/3(Vol.2))
MICROFLORA
See MICROORGANISMS
MICROORGANISMS
See also BACTERIA
PROTOZOA
Biological Stress
Thermal stress studies on selected zooplankton species and an isopod, 6:26326 (PB—81-115610)
Sensitivity
Effects of acidity on decomposition of organic matter in aquatic environments, 6:26282 (CONF-800365—)
MICROPROCESSORS
Portable computer to reduce gamma-ray spectra for plutonium isotopic ratios, 6:25174 (UCRL—53145)
Energy Efficiency
Energy conservation applications of microprocessors, 6:25783 (CONF-7910214—)
Uses
Energy conservation applications of microprocessors, 6:25783 (CONF-7910214—)
MICROWAVE OVENS
Energy Efficiency Standards
Minimum energy efficiency standards for ranges and ovens. Topical report, subtask 2.1, 6:25727 (SAI—026-79-858-LJ)
MICROWAVE POWER TRANSMISSION
Frequency Selection
Alternate frequency analysis for the solar power system, 6:25295 (DOE/ER/10160—T5)
MICROWAVE RADIATION
Biological Effects
Effects of low power microwaves on the local cerebral blood flow of conscious rats, 6:26398 (AD—A-090426)
MID-ATLANTIC REGION
See also NEW JERSEY
NEW YORK
Coastal Regions
Planetary boundary-layer wind model evaluation at a mid-Atlantic coastal site, 6:25420 (DOE/ET/23007—80/1)
MIDDLE DISTILLATES
See PETROLEUM DISTILLATES
MIGRATION (RADIONUCLIDE)
See RADIONUCLIDE MIGRATION
MILITARY EQUIPMENT
Fuels
Investigation of fire-vulnerability-reduction effectiveness of fire-resistant diesel fuel in armored vehicular fuel tanks. Final report 25 Sep 79-30 Sep 80, 6:25051 (AD—A-090129)
Physical Radiation Effects
Evaluation of military radiac equipment, 6:26100 (AD—460281)
MILK
Drying
Energy savings in milk production: mechanical vapour-recompression concentration (comparison to classical technology), 6:25772 (CONF-800272—)
Pasteurization
Energy aspects and potential energy savings of the new DASI process for milk sterilization, 6:25813
Sterilization
Energy aspects and potential energy savings of the new DASI process for milk sterilization, 6:25813
MILL TAILINGS
Decontamination
Engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25122 (DOE/UMT—0103)
Summary of the engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25123 (DOE/UMT—0103S)
Environmental Effects
Engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26197 (DOE/UMT—0102)
Summary of the engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26198 (DOE/UMT—0102S)
Radiation Monitoring
Engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26197 (DOE/UMT—0102)
Summary of the engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26198 (DOE/UMT—0102S)
Stabilization
Asphalt emulsion sealing of uranium mill tailings. 1980 annual report, 6:25133 (PNL—3752)
Engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25122 (DOE/UMT—0103)
Engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26197 (DOE/UMT—0102)
Summary of the engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25123 (DOE/UMT—0103S)

Summary of the engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26198 (DOE/UMT—0102S)

MINE-MOUTH GENERATING PLANTS
See FOSSIL-FUEL POWER PLANTS

MINERAL WOOL
See also THERMAL INSULATION
Heat Transfer
Fibrous insulation heat-transfer model, 6:25689
Physical Properties
Fibrous insulation heat-transfer model, 6:25689
R Factors
Measurement of the thermal resistance of thick low-density mineral fiber insulation, 6:25682
Thermal Conductivity
Measurement of the thermal resistance of thick low-density mineral fiber insulation, 6:25682

MINERALS
See also ANHYDRITE
BAUXITE
CLAYS
DOLOMITE
KAOLINITE
SILICA
Catalytic Effects
Effects of catalysts on short contact time coal liquefaction, 6:24882

MINING EQUIPMENT
Data Acquisition Systems
Power shovel data accumulator and display, 6:24943 (DOE/PC/30205—T1)

MINNESOTA
Acid Rain
Susceptibility of aquatic and terrestrial resources of Minnesota, Wisconsin, and Michigan to impacts from acid precipitation: informational requirements, 6:26122 (CONF-800365—)
Earth-Covered Buildings
Earth, energy, architecture and steel culvert construction, 6:25747
Energy Models
Energy modeling. Volume II. Inventory and details of state energy models (Book), 6:25592 (DOE/CS/10046—2(Vol.2))
Regional Analysis
Susceptibility of aquatic and terrestrial resources of Minnesota, Wisconsin, and Michigan to impacts from acid precipitation: informational requirements, 6:26122 (CONF-800365—)
Wind Power
Techniques for assessing the wind energy resource in the North Central region, 6:25414 (PNL—3667)

MINORITY GROUPS
See also ELDERLY PEOPLE
Directories
Minority Network Directory: appendix B, 6:26302 (DOE/MI/01002—T5(App.B))
Surveys
Identification of business opportunities for the minority-owned small businesses in the solar energy area. Final report, July 1980-January 1981, 6:25218 (DOE/MI/01002—T5)

MIRROR FUSION TEST FACILITY
See MFTF DEVICES

MIRRORS (MAGNETIC)
See MAGNETIC MIRRORS

MIS SOLAR CELLS
Efficiency
Loss mechanism analysis in single-crystal and polycrystalline silicon MIS solar cells to produce 13% efficiency, 6:25269
Energy Losses
Loss mechanism analysis in single-crystal and polycrystalline silicon MIS solar cells to produce 13% efficiency, 6:25269
Reviews
Review of conductor-insulator-semiconductor (CIS) solar cells, 6:25267

MISSISSIPPI
Industry
Waste disposal inventory for Mississippi-Alabama coastal counties, 6:26160 (PB—81-118994)
Wind Power
Techniques for assessing the wind energy resource in the Southeast region, 6:25416 (PNL—3669)

MISSOURI
Earth-Covered Buildings
Design innovations for a new minerals engineering building, 6:25740

MITES
Reproduction
Effects of acid precipitation on soil and forest. 7. Soil animals, 6:26354 (CONF-800365—)

MOBIL M-GASOLINE PROCESS
See also SYNTHETIC FUELS
Catalysts
Coal Technology '80. Volume 5. Synthetic fuels from coal. Volume 6. Industrial/utility applications for coal, 6:24892
Coal to gasoline via Mobil MTG technology, 6:24896
Flowsheets
Coal to gasoline via Mobil MTG technology, 6:24896

MOBILITY
Control
Mobility control and scaleup for chemical flooding, 6:25029 (DOE/BETC/IC—80/3(Vol.2))

MODELS (ATOMIC)
See ATOMIC MODELS

MODELS (FLOW)
See FLOW MODELS

MODELS (MATHEMATICAL)
See MATHEMATICAL MODELS

MODELS (PLASMA)
See PLASMA SIMULATION

MODERATORS
(See also descriptors for specific moderator materials.)
Stress Analysis
Accuracy of finite-element models for the stress analysis of multiple-holed moderator blocks, 6:25485 (GA-A—16234)

MODIFIED IN-SITU PROCESSES
See also OXY MODIFIED IN-SITU PROCESS
Feasibility Studies
Oil shale project run summary, small retort runs S-21 and S-23, 6:25086 (UCID—19082)

MOISTURE
See also WATER
Biological Effects
Response of bacteria in wastewater sludge to moisture loss by evaporation and effect of moisture content on bacterial inactivation by ionizing radiation (^{60}Co), 6:26321
Migration
Verification of partially saturated zone moisture migration: model and field facilities, 6:25113 (CONF-801217—)
Radiosensitivity Effects
Response of bacteria in wastewater sludge to moisture loss by evaporation and effect of moisture content on bacterial inactivation by ionizing radiation (^{60}Co), 6:26321

MOLECULAR IONS
See also HYDROGEN IONS 2 PLUS
HYDROGEN IONS 3 PLUS
Ion Spectroscopy
Foil dissociation of fast molecular ions into atomic excited states, 6:26449 (CONF-801111—49)

MOLECULAR MODELS
Self-Consistent Field
Quadratically convergent MCSCF theory for large-configuration sets, 6:26448 (CONF-800726—2)

MOLECULAR ORBITAL MODEL
See ATOMIC MODELS

MOLECULE COLLISIONS
See also ATOM-MOLECULE COLLISIONS
ELECTRON-MOLECULE COLLISIONS
PHOTON-MOLECULE COLLISIONS
Excitation
Electronic excitation in molecular collisions: structural, dynamic and kinetic considerations. Annual summary report no. 2, Sep 79-Aug 80, 6:26445 (AD—A-090287)

MOLLUSCS
See also SNAILS
Ecology
Freshwater bivalve mollusca (unionidae, sphaeriidae, corbiculidae) of the Savannah River Plant, South Carolina, 6:26211 (SRO-NERP—3)

Taxonomy
Freshwater bivalve mollusca (unionidae, sphaeriidae, corbiculidae) of the Savannah River Plant, South Carolina, 6:26211 (SRO-NERP—3)
Tolerance
Mussels and crustaceans: studies of 1000 lakes in Norway, 6:26375 (CONF-800365—)

MOLTEN CARBONATE FUEL CELLS
Design
Development of molten carbonate fuel-cell power plant. Quarterly technical progress report, August 1, 1980-October 31, 1980, 6:25665 (DOE/ET/17019—3)
Environmental Impacts
Fuel cell support studies: on-site molten carbonate systems. Final report 1 Dec 78-30 Nov 79, 6:25672 (PB—81-113672)
Performance Testing
Fuel cell support studies: on-site molten carbonate systems. Final report 1 Dec 78-30 Nov 79, 6:25672 (PB—81-113672)
Research Programs
High temperature molten carbonate fuel cells. Technical progress report, January-March 1979, 6:25664 (DOE/ET/11304—T12)

MOLYBDENUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)

MOLYBDENUM 92 TARGET
Deuteron Reactions
Collective and neutron-structure effects in the elastic scattering of vector polarized deuterons in the A = 90 mass region, 6:26584

MOLYBDENUM 98 TARGET
Deuteron Reactions
Collective and neutron-structure effects in the elastic scattering of vector polarized deuterons in the A = 90 mass region, 6:26584

MOLYBDENUM ALLOYS
Phase Studies
High-temperature Moessbauer study of ^{57}Fe interstitials in Chevrel phases, 6:25945 (CONF-800954—4)

MOLYBDENUM SULFIDES
Electric Conductivity
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Electronic Structure
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Superconductivity
Normal-state electronic properties of $Sn_{0.12}Eu_{1.09}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)

MONOCHROMATORS
Optical Dispersion
Periodic wavelength dispersion in a scanning UV monochromator, 6:26622

MONTANA
Geothermal Energy
Montana Geothermal Handbook: a guide to agencies, regulations, permits and financial aids for geothermal development, 6:25392 (DOE/ID/12014—T1)
Magnetic Surveys
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle (Montana). Final report, 6:25093 (GJBX—179-81-Vol.2A)
Airborne gamma-ray spectrometer and magnetometer survey: Hardin quadrangle (Montana). Final report, 6:25094 (GJBX—179-81-Vol.2B)
Airborne gamma-ray spectrometer and magnetometer survey: Roundup quadrangle (Montana). Final report, 6:25096 (GJBX—179-81-Vol.2D)
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle, Round Up quadrangle, Hardin quadrangle (Montana), Sheridan quadrangle, (Wyoming). Final report, 6:25092 (GJBX—179-81-Vol.1)
Airborne gamma-ray spectrometer and magnetometer survey: Jordan quadrangle, Miles City quadrangle, Glendive quadrangle (Montana), Watford City quadrangle, (North Dakota). Final report, 6:25097 (GJBX—180-81-Vol.1)
Radiometric Surveys
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle (Montana). Final report, 6:25093 (GJBX—179-81-Vol.2A)
Airborne gamma-ray spectrometer and magnetometer survey: Hardin quadrangle (Montana). Final report, 6:25094 (GJBX—179-81-Vol.2B)
Airborne gamma-ray spectrometer and magnetometer survey: Roundup quadrangle (Montana). Final report, 6:25096 (GJBX—179-81-Vol.2D)
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle, Round Up quadrangle, Hardin quadrangle (Montana), Sheridan quadrangle, (Wyoming). Final report, 6:25092 (GJBX—179-81-Vol.1)
Airborne gamma-ray spectrometer and magnetometer survey: Jordan quadrangle, Miles City quadrangle, Glendive quadrangle (Montana), Watford City quadrangle, (North Dakota). Final report, 6:25097 (GJBX—180-81-Vol.1)
Water Quality
Environmental effects of western coal combustion. Part III. The water quality of Rosebud Creek, Montana. Final report, 6:24937 (PB—81-113615)

MORTALITY
Data Analysis
Poisson trials approach to interpopulation comparisons of cause of death data, 6:26732
Epidemiology
Mortality in 191 counties near energy facilities: use of economic and social variables for standardization, 6:26393
Radioinduction
Morbidity and mortality in Los Alamos County, New Mexico. I. Methodological issues and preliminary results, 6:26320

MULE DEER
See DEER

MUNICIPAL BUILDINGS
See PUBLIC BUILDINGS

MUNICIPAL WASTES
See also REFUSE DERIVED FUELS
Anaerobic Digestion
Refuse conversion to methane (RefCOM): a proof-of-concept anaerobic digestion facility, 6:25187
Combustion
Mass burning of municipal solid waste - worldwide, 6:25846
Energy Recovery
Development and implementation of prepared solid waste fuels to energy projects through the architectural/engineering approach, 6:25825 (ANL/CNSV-TM—60)
ECO-FUEL/sup R/II: the third generation, 6:25827 (ANL/CNSV-TM—60)
Raytheon Service Company experience and programs in resource recovery, 6:26057 (ANL/CNSV-TM—60)
Refuse-derived fuels, 6:25844
Resouce recovery option in solid-waste management: a review guide for public officials , 6:25839 (DOE/CS/20156—T1)
Explosive Fracturing
Cannon shredding of municipal solid waste for the preparation of biological feedstock. Final report, 6:25837 (DOE/CE/20088—01)
Fluidized-Bed Combustion
Energy recovery from municipal solid waste and sewage sludge using multisolid fluidized-bed combustion technology, 6:25205
Gasification
Thermal conversion of solid wastes and biomass, 6:25183
Liquefaction
Thermal conversion of solid wastes and biomass, 6:25183
Materials Recovery
Raytheon Service Company experience and programs in resource recovery, 6:26057 (ANL/CNSV-TM—60)
Resouce recovery option in solid-waste management: a review guide for public officials , 6:25839 (DOE/CS/20156—T1)

Pyrolysis
Integrated system for solid waste disposal with energy recovery and volumetric reduction by a new pyrolysis furnace, 6:25189
PUROX system demonstration test on simulated Japanese refuse, 6:25188
Thermal conversion of solid wastes and biomass, 6:25183
Research Programs
Overview of the Department of Energy program for the recovery of energy and materials from urban solid waste, 6:25845
Resource Potential
Waste as a fuel, 6:25785 (CONF-7910214—)
Separation Processes
Advantages of the hydrasposal process as applied to the Hempstead Resources Recovery Plant and the Dade County Solid Waste Recovery Plant, 6:25830 (ANL/CNSV-TM—60)
Air classification (Waste Processing), 6:26056 (ANL/CNSV-TM—60)
Application of trommeling to prepared fuels, 6:26055 (ANL/CNSV-TM—60)
Cannon shredding of municipal solid waste for the preparation of biological feedstock. Final report, 6:25837 (DOE/CE/20088—01)
Economical and reliable disposal and solid waste by Combustion Engineering, Inc, the domestic supplier of energy systems worldwide, 6:26058 (ANL/CNSV-TM—60)
New generation - the Flakt recovery system, 6:25831 (ANL/CNSV-TM—60)
Waste Management
Implementation of a resource recovery program: full service approach, 6:25824 (ANL/CNSV-TM—60)
Waste Processing
Overview of prepared fuels technology, 6:25201 (ANL/CNSV-TM—60)
Shredding for prepared fuel systems, 6:26054 (ANL/CNSV-TM—60)
MUON REACTIONS
Inclusive Interactions
Shadowing in muon-nucleus scattering, 6:26483
Shadow Effect
Shadowing in muon-nucleus scattering, 6:26483
MUONIC ATOMS
Energy-Level Transitions
Calculation of the 3p-3d transitions in muonic helium, 6:26455
MUONIC MOLECULES
Spin
Muon states in the antiferromagnetic oxides α-Fe_2O_3 and $FeTiO_3$, 6:25950 (LA-UR—81-1017)
MUON-NUCLEON INTERACTIONS
Particle Production
Open and hidden charm muoproduction, 6:26500
MUONS
See also MUONS MINUS
Pair Production
Using $e^+ e^-$ cross-sections to test QCD and to search for new particles, 6:26549
MUONS MINUS
Atom Collisions
Diabatic-state treatment of negative-meson moderation and capture. I. The hydrogen atom, 6:26464
MUSEUMS
See EDUCATIONAL FACILITIES
MUSSELS
See MOLLUSCS
MX DEVICES
See MFTF DEVICES
MYELOID LEUKEMIA
Radiotherapy
Cytogenetic evidence for recurrence of acute myelogenous leukemia after allogeneic bone marrow transplantation in donor hematopoietic cells, 6:26312
MYOCARDIAL INFARCTION
Diagnosis
Myocardial uptake of sup(123m)Te-labeled long-chain fatty acids. Effects of heteroatom position and total chain length, 6:26311
MYOCARDIUM
Positron Computed Tomography
In vivo quantitation of regional myocardial blood flow by positron-emission computed tomography (Dogs; ^{68}Ga; ^{141}Ce), 6:26309
N-13 ammonia as an indicator of myocardial blood flow (Dogs), 6:26310
Uptake
Myocardial uptake of sup(123m)Te-labeled long-chain fatty acids. Effects of heteroatom position and total chain length, 6:26311

N

NAPHTHA
Chemical Composition
Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant, 6:24848 (DOE/ET/13060—T4)
Removal
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))
NAPHTHALENE
Chemical Reactions
Exploratory study of reactivity in organic compounds subjected to shock loading, 6:25993 (SAND—81-1386C)
Oxidation
HPLC and phase transfer catalysis in the analysis of oxidation products of lignite liquids and model compounds (Oxidizing agents: trifluoroperacetic acid, ruthenium tetraoxide, ceric ammonium nitrate, potassium permanganate), 6:24912
NAPHTHALIC ACID
See PHTHALIC ACID
NAPHTHOLS
Chemical Reactions
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877
NAPHTHOLS-ALPHA
See NAPHTHOLS
NAPHTHOLS-BETA
See NAPHTHOLS
NATIONAL ACCELERATOR LABORATORY
See FERMILAB ACCELERATOR
NATIONAL ENVIRONMENTAL POLICY ACT
Implementation
Preliminary evaluation of DOE-NEPA monitoring system, 6:26147 (DOE/EV/10475—1)
NATURAL CIRCULATION
See NATURAL CONVECTION
NATURAL CONVECTION
Finite Element Method
Calculational method for combined natural circulation and forced-convection flow in a channel (LMFBR), 6:25518 (CONF-800723—26)
Numerical Analysis
Numerical study of natural convection in a horizontal porous layer subjected to an end-to-end temperature difference, 6:26043
NATURAL DRAFT COOLING TOWERS
Plumes
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 2. Salt drift deposition from natural draft cooling towers. Technical report, 6:25460 (NUREG/CR—1581-V-2)

NATURAL GAS
See also LIQUEFIED NATURAL GAS
Consumption Rates
Fuel cell support studies: on-site molten carbonate systems. Final report 1 Dec 78-30 Nov 79, 6:25672 (PB—81-113672)
Deregulation
Preliminary analysis of the natural gas market-ordering problem, 6:25073 (UT/CES-PS—15)
Fuel Supplies
Long-range oil and gas supply methodology: proposed reformulation, 6:25626 (BNL—51359)
Maritime Transport
National petroleum reserve - Alaska: marine transportation system analysis. Executive summary, 6:25048 (PB—81-105033)
National petroleum reserve - Alaska: marine transportation system analysis. Final report, 6:25049 (PB—81-105041)
Research Programs
Energy/economic model analysis. Macroeconomic impacts of research and development in gas supply and end use technologies. Final report, 6:25066 (PB—81-114258)
NATURAL GAS DEPOSITS
Geochemical Surveys
Resource assessment of the eastern gas shales, 6:25067 (MLM—2831(OP))
Geology
Evaluation of Devonian shale potential in West Virginia, 6:25068 (DOE/MC/10389—T1)
NATURAL GAS DISTRIBUTION SYSTEMS
See also PIPELINES
Flowmeters
Ten years with turbine metering, 6:26030
Gas Compressors
Compressor station noise-abatement: a case study, 6:25074
Pipeline bottoming-cycle study: operational reliability and maintainability assessment, 6:25075 (GESP—813)
Gas Flow
Ten years with turbine metering, 6:26030
Gas Meters
Field method for determining pulsation in orifice meters, 6:25077
NATURAL GAS GATHERING SYSTEMS
See NATURAL GAS DISTRIBUTION SYSTEMS
NATURAL GAS INDUSTRY
Energy Conservation
Energy sense is common sense, 6:25786 (CONF-7910214—)
NATURAL GAS WELLS
Well Stimulation
Economic analysis of foam fracturing in the Devonian shales: preliminary report, 6:25072
NATURAL URANIUM
Resource Depletion
Resource consequences of reenrichment versus blending, 6:25500 (HEDL-SA—2322-FP)
NEBRASKA
Wind Power
Techniques for assessing the wind energy resource in the North Central region, 6:25414 (PNL—3667)
NEMATODES
Food Chains
Microbial trophic structure and habitable pore space in soil, 6:26180
NEODYMIUM BORIDES
Evaporation
Phase relationship, vaporization, and thermodynamic properties of neodymium hexaboride, 6:25986
Phase Studies
Phase relationship, vaporization, and thermodynamic properties of neodymium hexaboride, 6:25986
Thermodynamic Properties
Phase relationship, vaporization, and thermodynamic properties of neodymium hexaboride, 6:25986
NEODYMIUM LASERS
Frequency Converters
Efficient second-harmonic generation of Nd:YAG laser radiation using warm phasematching $LiNbO_3$, 6:26036
NEON 20
Energy Levels
Beta-ray branching in the decay of ^{20}F, 6:26580
NEON 20 REACTIONS
Compound-Nucleus Reactions
Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near $N \sim 50$, 6:26587
NEOPLASMS
See also LYMPHOMAS
Radioinduction
History of health studies around nuclear facilities: a methodologival consideration, 6:26319
Morbidity and mortality in Los Alamos County, New Mexico. I. Methodological issues and preliminary results, 6:26320
NEPA
See NATIONAL ENVIRONMENTAL POLICY ACT
NETHERLANDS
Atmospheric Chemistry
Detection of acid compounds in the atmosphere by careful sampling and analysis of rainwater, 6:26134 (CONF-800365—)
Atmospheric Precipitations
Meteorological interpretation of the chemical composition of precipitation and some results of sequential rain sampling, 6:26135 (CONF-800365—)
Energy Demand
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
Resource Recovery Facilities
New generation - the Flakt recovery system, 6:25831 (ANL/CNSV-TM—60)
NETWORKS (COMPUTER)
See COMPUTER NETWORKS
NEUTRAL BEAM SOURCES
See also ION SOURCES
Control Systems
Obtaining full operation for a large suite of neutral-beam injectors, 6:26713 (UCRL—86041)
Neutron Transport
Neutron and gamma-ray streaming calculations for the ETF neutral-beam injectors, 6:26630 (CONF-810606—46)
Photon Transport
Neutron and gamma-ray streaming calculations for the ETF neutral-beam injectors, 6:26630 (CONF-810606—46)
NEUTRINO-NUCLEON INTERACTIONS
See also ANTINEUTRINO-NUCLEON INTERACTIONS
Charged-Current Interactions
Observation of charmed F^+ meson produced by neutrino interaction in emulsion, 6:26504
Recent results from the CFRR neutrino experiment at Fermilab, 6:26517
Pair Production
Same-sign dilepton puzzle, 6:26527
NEUTRINOS
Mass
How large are the neutrino mixing angles?, 6:26526
Neutrino oscillations of the second class, 6:26544
Oscillations
Neutrino oscillation phenomenlogy, 6:26503
Neutrino oscillations of the second class, 6:26544
Quantum mechanics of neutrino oscillation, 6:26522
NEUTRON DETECTION
Neutron Detectors
Microchannel plate response to high-energy neutrons, 6:26638 (PPPL—1773)
NEUTRON DETECTORS
See also HE-3 COUNTERS
Response Functions
Microchannel plate response to high-energy neutrons, 6:26638 (PPPL—1773)
NEUTRON DOSIMETRY
Lyoluminescence
Lyoluminescent dosimetric materials and their response to ionizing radiation, 6:26084
NEUTRON FLUX
Measuring Instruments
Initial neutron and gamma air-earth interface measurements. Final report, 6:26101 (AD—464381)

NEUTRON MULTIPLIER FACILITY
See SUBCRITICAL ASSEMBLIES

NEUTRON REACTIONS
Analyzing Power
Zero-crossing angle in the np analyzing power at medium energies and its relation to charge symmetry, 6:26576
Capture
Evaluation of ^{232}Th for ENDF/B-V, 6:26595 (BNL-NCS—51360)
Cross Sections
Data interpretation, objective evaluation procedures and mathematical techniques for the evaluation of energy-dependent ratio, shape and cross section data, 6:26596 (CONF-800979—19)
Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions, 6:26597 (CONF-810606—53)
Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions, 6:26598 (CONF-810606—68)
Fission
Evaluation of ^{232}Th for ENDF/B-V, 6:26595 (BNL-NCS—51360)
Inelastic Scattering
Calculation of neutron and gamma-ray production cross sections for calcium from 8 to 20 MeV, 6:26581 (ORNL/TM—7752)
Pickup Reactions
Calculation of neutron and gamma-ray production cross sections for calcium from 8 to 20 MeV, 6:26581 (ORNL/TM—7752)
Quasi-Elastic Scattering
Calculation of neutron and gamma-ray production cross sections for calcium from 8 to 20 MeV, 6:26581 (ORNL/TM—7752)
Resonance Scattering
Neutron strength functions: the link between resolved resonances and the optical model, 6:26601 (CONF-800979—18)
Thermal Fission
Yields of fission products produced by thermal-neutron fission of ^{249}Cf, 6:26600

NEUTRON SOURCES
(Excludes reactors even when used as neutron sources.)
Pulse Techniques
Pulsed neutron sources for condensed-matter research, 6:25175 (CONF-801111—45)

NEUTRON STARS
Temperature Measurement
Coldest neutron star, 6:26434

NEUTRON TRANSPORT
Data Compilation
FLUNG: coupled 35-group neutron and 21-group gamma ray, P_3 cross sections for fusion applications, 6:26702 (ORNL/TM—7828)

NEUTRON-RICH ISOTOPES
Energy Levels
Spectroscopy and mass measurements of neutron rich isotopes by the (t,α) reaction, 6:26590 (LA-UR—81-1721)
Triton Reactions
Spectroscopy and mass measurements of neutron rich isotopes by the (t,α) reaction, 6:26590 (LA-UR—81-1721)

NEUTRONS
Absorption
Neutron-photon multigroup cross sections for neutron energies $\leqq$ 400 MeV, 6:26610 (ORNL/TM—7818)

NEVADA
Geology
Nevada Nuclear Waste Storage Investigations. Geologic and hydrologic investigation of Yucca Mountain: peer review documentation, 6:25127 (NVO—196-22)
Geothermal Resources
Geothermal policy project. Quarterly report, November 1, 1979-January 31, 1980, 6:25407 (DOE/SF/01795—T2)
Hydrology
Nevada Nuclear Waste Storage Investigations. Geologic and hydrologic investigation of Yucca Mountain: peer review documentation, 6:25127 (NVO—196-22)
Wind Power
Techniques for assessing the wind energy resource in the Southwest region, 6:25418 (PNL—3672)

NEVADA TEST SITE
Domestic Animals
Selected radioisotopes in animal tissues in Nevada: ^{90}Sr and ^{137}Cs measurements from 1956 to 1977, 6:26195 (DOE/DP/00539—040)
Wild Animals
Animal Investigation Program: Nevada Test Site and Vicinity. Annual report, 1979, 6:26196 (DOE/DP/00539—042)
Selected radioisotopes in animal tissues in Nevada: ^{90}Sr and ^{137}Cs measurements from 1956 to 1977, 6:26195 (DOE/DP/00539—040)

NEW ENGLAND
See NORTH ATLANTIC REGION

NEW HAMPSHIRE
Wind Power
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)

NEW JERSEY
Wind Power
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)

NEW MEXICO
Energy Models
Energy modeling. Volume II. Inventory and details of state energy models (Book), 6:25592 (DOE/CS/10046—2(Vol.2))
Wind Power
Techniques for assessing the wind energy resource in the Southern Rocky Mountain region, 6:25417 (PNL—3671)

NEW YORK
Energy Models
Energy modeling. Volume II. Inventory and details of state energy models (Book), 6:25592 (DOE/CS/10046—2(Vol.2))
Radioactive Waste Disposal
Computer simulation of groundwater flow at a commercial radioactive-waste landfill near West Valley, Cattaraugus County, New York, 6:25116 (CONF-801217—)
Resource Recovery Facilities
Advantages of the hydrasposal process as applied to the Hempstead Resources Recovery Plant and the Dade County Solid Waste Recovery Plant, 6:25830 (ANL/CNSV-TM—60)
Raytheon Service Company experience and programs in resource recovery, 6:26057 (ANL/CNSV-TM—60)
Wind Power
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)

NICKEL
Chemical Preparation
Studies on unusually reactive metal powders. Preparation on new organometallic and organic compounds including potential new catalysts. Progress report, July 1, 1980-March 15, 1981, 6:25991 (DOE/ER/10603—1)
Electron Reactions
Mesonic processes in deep-inelastic electron scattering from nuclei, 6:26607
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies $\leqq$ 400 MeV, 6:26610 (ORNL/TM—7818)
Photoemission
Photoemission measurements for low energy x-ray detector applications, 6:26609 (LA-UR—81-1712)
Pion Reactions
Inclusive reactions of pions on nuclei, 6:26575

NICKEL 58 TARGET
Lithium 7 Reactions
Strong j-dependent effects in (^{7}Li, ^{6}Li) reactions, 6:26582
NICKEL 60
Giant Resonance
Threshold photoneutron angular distribution and polarization studies of nuclei, 6:26591 (CONF-801111—48)
NICKEL 60 TARGET
Photonuclear Reactions
Threshold photoneutron angular distribution and polarization studies of nuclei, 6:26591 (CONF-801111—48)
NICKEL 62 TARGET
Oxygen 16 Reactions
High spin structure of ^{75}Br and the (N,Z) dependence of the nuclear deformation in the Br region, 6:26585
NICKEL ALLOYS
Melting
Pulsed laser mixing of Ni-Au surface films on nickel substrates, 6:25895 (CONF-801124—50)
NICKEL COMPLEXES
Chemical Reactions
Radiation chemical studies of nickel-glycine. Hydrogen abstraction by OH radicals and oxidation by Br_2^{-1} (Gamma radiation), 6:26003
NICKEL OXIDES
Dislocations
Observations on grain-boundary structures in nickel oxide (Low-angle boundaries), 6:25935 (CONF-800765—10)
Grain Boundaries
Energies of <110> coincidence twist boundaries, stacking faults, and free surfaces in metal oxides with NaCl structure, 6:26613 (CONF-800765—9)
Stacking Faults
Energies of <110> coincidence twist boundaries, stacking faults, and free surfaces in metal oxides with NaCl structure, 6:26613 (CONF-800765—9)
NICKEL-IRON BATTERIES
See IRON-NICKEL BATTERIES
NICKEL-ZINC BATTERIES
Performance
Progress and forecast in electric-vehicle batteries, 6:25878 (CONF-800939—2)
Research Programs
Near-term batteries for electric vehicles, 6:25586 (CONF-810315—13)
NIGERIA
Petroleum Deposits
Estimating undiscovered oil resources: an engineering approach, 6:24973
NIOBATES
Recrystallization
Crystallographic properties of lithium niobate shock-loaded from 3.7 to 20 GPa and preserved for post-shock study, 6:25952 (SAND—81-1315C)
NIOBIUM
Chemical Analysis
Chemical makeup of Nb and Nb_3Sn films, 6:25983 (SAND—81-0969C)
Isotope Effects
Isotope effect in niobium self-diffusion, 6:25918
Neutron Diffraction
Neutron scattering measurements of low-temperature hydrogen tunneling in niobium, 6:26608 (BNL—28332)
Self-Diffusion
Isotope effect in niobium self-diffusion, 6:25918
Tunnel Effect
Neutron scattering measurements of low-temperature hydrogen tunneling in niobium, 6:26608 (BNL—28332)
NIOBIUM 84
Decay
Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$, 6:26583 (BNL—29658)
NIOBIUM 93 TARGET
Boron 10 Reactions
Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near $N \sim 50$, 6:26587
NIOBIUM BASE ALLOYS
Crystallography
Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices, 6:25957
Electron Diffraction
Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices, 6:25957
NIOBIUM NITRIDES
Superconductivity
Vortex unbinding in superconducting thin films, 6:26618 (CONF-800561—4)
NITRATES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977
Monitoring
Snow pack storage and ion release, 6:26190 (CONF-800365—)
NITRIC ACID
Chemical Reactions
Oxidations of Illinois No. 6 coal at and below 60°C (Oxidizing agents are sodium hypochlorite, nitric acid and potassium butoxide), 6:24910
Purification
Removal of fluoride from aqueous nitric acid, 6:25100 (ORNL/TM—7502)
NITRITES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977
NITRO COMPOUNDS
Electric Conductivity
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Thermodynamic Properties
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Viscosity
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
NITROGEN
Annual Variations
Annual nutrient cycles in a marine microcosm, 6:26242
Biological Effects
Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238
Level Widths
Direct calculation of resonance energies and widths using an R-matrix approach, 6:26463
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies $\leqq$ 400 MeV, 6:26610 (ORNL/TM—7818)
NITROGEN 13
Positron Computed Tomography
N-13 ammonia as an indicator of myocardial blood flow (Dogs), 6:26310
NITROGEN COMPOUNDS
Environmental Transport
Hydrogen, sulphur and nitrogen budgets in soils and catchments, 6:26275 (CONF-800365—)
NITROGEN DIOXIDE
Ecological Concentration
Profile of air quality in Region V, 6:26171 (PB—81-116097)
NITROGEN OXIDES
See also NITROGEN DIOXIDE
Air Pollution Control
Emissions characteristics of light-duty diesel vehicles, 6:25859 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from alcohol and ether blends, 6:25886 (DOE/BETC/IC—80/3(Vol.4))
Exhaust and evaporative emissions from gasohol-type fuels, 6:25887 (DOE/BETC/IC—80/3(Vol.4))
Feasibility of operating medium-speed diesel engines with coal derived liquids, 6:25439 (DOE/BETC/IC—80/3(Vol.4))
Fleet trials using methanol/gasoline blends, 6:25890 (DOE/BETC/IC—80/3(Vol.4))
Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4))

USAF aircraft engine emission goals: a critical review. Final report Sep 78-Jun 79, 6:25853 (AD—A-090282)
Biological Effects
Nitrogen oxide air pollution: biological effects. 1964-August, 1980 (citations from the NTIS data base). Report for 1964-Aug 80, 6:26390 (PB—81-800203)
Decomposition
The decomposition of N_2O on Ni(110). Technical report, 6:26110 (AD—A-090552)
Foliar Uptake
Deposition of nitrogen oxides to Scots pine (Pinus sylvestris L.), 6:26342 (CONF-800365—)
NONBRANDED INDEPENDENT MARKETERS
See MARKETERS
NONDESTRUCTIVE TESTING
Stress Analysis
Displacement discontinuity method applied to NDE-related stress problems, 6:26045 (IS-M—328)
NORBORNADIENE
Photochemical Energy Storage
Organic photochemical storage of solar energy. Progress report, February 1, 1980-January 31, 1981, 6:25248 (DOE/ER/04380—T1)
NORTH ATLANTIC REGION
See also CONNECTICUT
MAINE
MASSACHUSETTS
NEW HAMPSHIRE
RHODE ISLAND
VERMONT
Buildings
Building energy-performance-standards conference: Proceedings. Strategy paper number 12, 6:25691 (CONF-800277—)
Sampling
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. IV. Synthesis, and comparison with New England, 6:26274 (CONF-800365—)
Small-Scale Hydroelectric Power Plants
Small-scale hydro in New England: 1960-1976, 6:25215
NORTH CAROLINA
Wind Power
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)
NORTH DAKOTA
Magnetic Surveys
Airborne gamma-ray spectrometer and magnetometer survey: Jordan quadrangle, Miles City quadrangle, Glendive quadrangle (Montana), Watford City quadrangle, (North Dakota). Final report, 6:25097 (GJBX—180-81-Vol.1)
Radiometric Surveys
Airborne gamma-ray spectrometer and magnetometer survey: Jordan quadrangle, Miles City quadrangle, Glendive quadrangle (Montana), Watford City quadrangle, (North Dakota). Final report, 6:25097 (GJBX—180-81-Vol.1)
Wind Power
Techniques for assessing the wind energy resource in the North Central region, 6:25414 (PNL—3667)
NORTHERN IRELAND
See UNITED KINGDOM
NORWAY
Regional Analysis
Sulfate at Birkenes, a small forested catchment in southernmost Norway, 6:26277 (CONF-800365—)
Transfrontier Pollution
Contribution from long-range atmospheric transport to the heavy metal pollution of surface soil, 6:26119 (CONF-800365—)
NOZZLES
Design
Hypersonic beam laser photolysis. Technical progress report, July 15, 1980-March 15, 1981, 6:25997 (DOE/ER/06035—3)
NUCLEAR ENERGY
Forecasting
Forecasts of nuclear power and nuclear fuel requirements, 6:25612
Research Programs
DOE nuclear program--promise and perspective, 6:25614
NUCLEAR EXPLOSIONS
See also UNDERGROUND EXPLOSIONS
Ground Subsidence
Why you see what you see looking down at an underground explosion, 6:26102 (UCID—19031)
Ground Uplift
Why you see what you see looking down at an underground explosion, 6:26102 (UCID—19031)
Radiation Flux
Evaluation of military radiac equipment, 6:26100 (AD—460281)
Initial neutron and gamma air-earth interface measurements. Final report, 6:26101 (AD—464381)
NUCLEAR FACILITIES
See also ANTARES FACILITY
FEED MATERIALS PLANTS
FUEL CYCLE CENTERS
FUEL FABRICATION PLANTS
FUEL REPROCESSING PLANTS
Risk Assessment
History of health studies around nuclear facilities: a methodologival consideration, 6:26319
Morbidity and mortality in Los Alamos County, New Mexico. I. Methodological issues and preliminary results, 6:26320
Safety
Evaluation of the seismic integrity of a plutonium-handling facility, 6:25170 (UCRL—85458)
NUCLEAR FUELS
See also FUEL ELEMENTS
FUEL SLURRIES
LIQUID FUELS
SPENT FUELS
Burnup
Depletion analysis and sensitivity study of PHENIX fuel-irradiation experiments, 6:25489 (CONF-810606—56)
Forecasting
Forecasts of nuclear power and nuclear fuel requirements, 6:25612
Meetings
Atomic Industrial Forum, Inc. fuel cycle conference, 1979, 6:25103
NUCLEAR INDUSTRY
Reactor Accidents
Reaction of the nuclear industry to the Three Mile Island accident, 6:25559
NUCLEAR MATERIALS MANAGEMENT
Risk Assessment
INFCE past midcourse, 6:25615
NUCLEAR MATTER
Isospin
Pauli blocking in the nuclear medium πN transition matrix, 6:26605
NUCLEAR POWER
Hazards
Risks and consequences in energy production, 6:25608
Public Information
Press and nuclear energy, 6:25546
Public Opinion
Three Mile Island and the scientific community, 6:25558
Risk Assessment
Risks and consequences in energy production, 6:25608
NUCLEAR POWER PLANTS
Engineered Safety Systems
Three Mile Island in perspective: keynote address, 6:25540
Isotope Separation
DOE's enrichment services--a long range policy, 6:25613
Planning
Study of factors governing US utility nuclear power decisions, 6:25482 (DOE/ET/34009—T1)
Quality Assurance
Three Mile Island in perspective: keynote address, 6:25540
Reactor Accidents
Shared responsibilities of the utility and the media in crisis situations, 6:25549
Reactor Maintenance
Nuclear reactor maintenance technology assessment. Final summary report, September 16, 1978-September 15, 1979, 6:25499 (DOE/OR/06102—T1)

Reactor Safety
Response of the Nuclear Regulatory Commission to the accident at Three Mile Island, 6:25556
Three Mile Island in perspective: keynote address, 6:25540
Regulations
Lessons of Three Mile Island for the institutional management and regulation of nuclear power, 6:25565
Reassessing the nuclear option: Three Mile Island from a state perspective, 6:25560
Response of the Nuclear Regulatory Commission to the accident at Three Mile Island, 6:25556
NUCLEAR REACTIONS
See also FISSION
PHOTONUCLEAR REACTIONS
Fluctuations
Random-matrix physics: spectrum and strength fluctuations, 6:26606
NUCLEAR STRUCTURE
Applications of moment methods to finite nuclei, 6:26603 (ISM—320)
Theoretical nuclear structure studies using kaons and alpha particles. Progress report, June 1, 1980-May 31, 1981, 6:26602 (DOE/ER/10407—2)
NUCLEAR WASTES
See RADIOACTIVE WASTES
NUCLEAR WEAPON TESTS
See NUCLEAR EXPLOSIONS
NUCLEAR WEAPONS
Projectiles
Sandia technology, Volume 5, No. 4, 6:26620 (SAND—81-1065)
NUCLEI
See also HEAVY NUCLEI
Ergodic Hypothesis
Random-matrix physics: spectrum and strength fluctuations, 6:26606
NUCLEON-NUCLEON INTERACTIONS
See also PROTON-NEUTRON INTERACTIONS
PROTON-PROTON INTERACTIONS
Scattering Amplitudes
Review of N—N scattering, 6:26495
NUCLEONS
See also NEUTRONS
PROTONS
Mass Difference
Calculability of the N-P mass difference in gauge theories, 6:26543
NUTRIENTS
Foliar Uptake
Influence of rainfall composition on the yield and quality of agricultural crops, 6:26334 (CONF-800365—)
Leaching
Acid precipitation, plant nutrients and forest growth, 6:26337 (CONF-800365—)
Effects of acid precipitation on soil and forest. 4. Leaching of plant nutrients, 6:26352 (CONF-800365—)
Effects of acid precipitation on soil and forest. 5. Release and loss of nutrients from a Norwegian forest soil due to artificial rain of varying acidity, 6:26188 (CONF-800365—)
Uptake
Effects of acid precipitation on soil and forest. 6. Lysimeter experiment in greenhouse, 6:26353 (CONF-800365—)
Semitropical marine microcosms: facility design and an elevated-nutrient-effects experiment, 6:26246
NUTS
See FASTENERS

O

OAK RIDGE NATIONAL LABORATORY
See ORNL
OCCIDENTAL FLASH PYROLYSIS PROCESS
Bench-Scale Experiments
Controlled flash pyrolysis, 6:24859 (DOE/PC/30264—06)
Material Balance
Controlled flash pyrolysis, 6:24859 (DOE/PC/30264—06)
Yields
Controlled flash pyrolysis, 6:24859 (DOE/PC/30264—06)
OCCUPATIONAL SAFETY
Management
Guidance for implementing an Environmental, Safety and Health Assurance Program. Volume 9. Model guidelines for environmental safety and health analysis activities, 6:26403 (SAND—81-0640)
Program standard for assuring that today's management obligations in environmental, safety, and health areas are met, 6:25607 (SAND—81-1359C)
OCEAN THERMAL ENERGY CONVERSION
Condensers
OTEC gas-desorption studies, 6:25314 (CONF-810622—2)
Environmental Impacts
Preliminary evaluation of impingement and entrainment by ocean thermal energy conversion (OTEC) plants, 6:25319 (LBL—11833)
Open-Cycle Systems
OTEC gas-desorption studies, 6:25314 (CONF-810622—2)
Thermoelectric Generators
Thermoelectric energy converter for generation of electricity from low-grade heat (Patent), 6:25658
OCEAN THERMAL POWER PLANTS
Computer Codes
Theory and user manual for OTEC C. W. pipe programs ROTECF and SEGPIP, 6:25317 (DOE/NOAA/OTEC—35)
Condensers
Ammonia condensation experiments at Oak Ridge National Laboratory, 6:25313 (CONF-810622—1)
Design
Conceptual design study: cold water pipe systems for shelf-mounted OTEC powerplants. Final report, 6:25318 (DOE/NOAA/OTEC—36)
Ocean thermal energy conversion power system development-II. Phase II. Final design report, 6:25316 (DOE/ET/21056—T3)
OTEC Pilot Plant: requirements to design fabrication inspection, maintenance and repair of Hull, CWP and SKSS, 6:25253 (DOE/NOAA/OTEC—38)
Theory and user manual for OTEC C. W. pipe programs ROTECF and SEGPIP, 6:25317 (DOE/NOAA/OTEC—35)
Direct Contact Heat Exchangers
Direct-contact heat exchangers for OTEC: some advantages and disadvantages, 6:25315 (CONF-810622—5)
Environmental Impacts
Ocean energy technologies: an environmental overview, 6:25321
Installation
Conceptual design study: cold water pipe systems for shelf-mounted OTEC powerplants. Final report, 6:25318 (DOE/NOAA/OTEC—36)
Mathematical Models
Theory and user manual for OTEC C. W. pipe programs ROTECF and SEGPIP, 6:25317 (DOE/NOAA/OTEC—35)
Pilot Plants
OTEC Pilot Plant: requirements to design fabrication inspection, maintenance and repair of Hull, CWP and SKSS, 6:25253 (DOE/NOAA/OTEC—38)
Pipes
Conceptual design study: cold water pipe systems for shelf-mounted OTEC powerplants. Final report, 6:25318 (DOE/NOAA/OTEC—36)
Theory and user manual for OTEC C. W. pipe programs ROTECF and SEGPIP, 6:25317 (DOE/NOAA/OTEC—35)
Specifications
OTEC Pilot Plant: requirements to design fabrication inspection, maintenance and repair of Hull, CWP and SKSS, 6:25253 (DOE/NOAA/OTEC—38)
Technology Assessment
Ocean energy technologies: an environmental overview, 6:25321
OCEANS
See SEAS

ODOCOILEUS
See DEER
ODOR
Pollution Control
Ventilation requirements for control of occupancy odor and tobacco smoke odor: laboratory studies. Final report, 6:26400 (LBL—12589)
OFFICE BUILDINGS
Solar Space Heating
Solar heating and hot water system installed at Alderson Broaddus College, Philippi, West Virginia, 6:25341 (DOE/NASA/CR—161756)
Solar Water Heating
Solar heating and hot water system installed at Alderson Broaddus College, Philippi, West Virginia, 6:25341 (DOE/NASA/CR—161756)
Underground
Earth, energy, architecture and steel culvert construction, 6:25747
OFF-PEAK ENERGY STORAGE
Lead-Acid Batteries
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells. Final report (Hydrogen-oxygen gas recombination device), 6:25583 (ANL/OEPM—80-8)
OHIO
Energy Models
Energy modeling. Volume II. Inventory and details of state energy models (Book), 6:25592 (DOE/CS/10046—2(Vol.2))
Forests
Quantitative analysis of forest island pattern in selected Ohio landscapes, 6:26176 (ORNL/TM—7759)
Resource Recovery Facilities
Private sector viewpoint of waste flow control for the DOE/EPA conference on prepared fuels and resource recovery technology, 6:25832 (ANL/CNSV-TM—60)
Wind Power
Techniques for assessing the wind energy resource in the Great Lakes region, 6:25415 (PNL—3668)
OIL RESIDUES
See PETROLEUM RESIDUES
OIL SANDS
Chemical Effluents
Alberta oil sands environmental research program. An overview, 6:26132 (CONF-800365—)
Dielectric Properties
rf heating of Utah tar sands. Final report, October 1978-December 1979, 6:25083 (DOE/CH/90035—4)
In-Situ Processing
rf heating of Utah tar sands. Final report, October 1978-December 1979, 6:25083 (DOE/CH/90035—4)
Research Programs
US Department of Energy-Fossil Energy Laramie Energy Technology Center tar sand research and development program, FY 1980, 6:25081 (DOE/BETC/IC—80/3(Vol.1))
Steam Injection
Steam injection test in the Northwest Asphalt Ridge tar sand deposit near Vernal, Utah, 6:25082 (DOE/BETC/IC—80/3(Vol.1))
OIL SHALE DEPOSITS
Resource Assessment
Synthetic fuels from eastern oil shale. Final report (Parcho; HYTORT), 6:25084 (DOE/R4/10185—T1)
OIL SHALE MINING
See also SURFACE MINING
Synthetic fuels from eastern oil shale. Final report (Parcho; HYTORT), 6:25084 (DOE/R4/10185—T1)
Explosive Fracturing
Calculations of cratering experiments with the bedded crack model, 6:25080 (LA-UR—81-1659)
OIL SHALES
See also BLACK SHALES
OXY MODIFIED IN-SITU PROCESS
Activation Analysis
Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)
Explosive Fracturing
Sandia technology, Volume 5, No. 4, 6:26620 (SAND—81-1065)
In-Situ Retorting
Analysis of the operation of Occidental's Modified In-Situ Retort 6, 6:25087 (UCRL—85312)
Modified In-Situ Processes
Oil shale project run summary, small retort runs S-21 and S-23, 6:25086 (UCID—19082)
Resource Assessment
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)
Retorting
Hydrogasification of oil shale. Final report Jan 72-Dec 79, 6:25085 (PB—81-114092)
Synthetic fuels from eastern oil shale. Final report (Parcho; HYTORT), 6:25084 (DOE/R4/10185—T1)
OIL WELLS
See also PETROLEUM
Carbon Dioxide Injection
Granny's Creek CO_2 injection project, clay county, west virginia., 6:25037
Single CO_2 injection well minitest in a low-permeability eastern carbonate reservoir--a preliminary report, 6:25036
Caustic Flooding
Alkaline waterflooding demonstration project Ranger Zone, Long Beach Unit, Wilmington Field, California, 6:25005 (DOE/BETC/IC—80/3(Vol.2))
Improved oil recovery by alkaline flooding in the Huntington Beach field, 6:25003 (DOE/BETC/IC—80/3(Vol.2))
In-Situ Combustion
Numerical modeling of thermal recovery processes SUPRI-TR-12, 6:25034 (DOE/ET/12056—12)
Microemulsion Flooding
Commercial scale demonstration of the Maraflood process: M-1 project, Crawford County, Illinois, 1979-1980, 6:25010 (DOE/BETC/IC—80/3(Vol.2))
Improved oil recovery by micellar-polymer flooding El Dorado, Kansas, field, 6:25004 (DOE/BETC/IC—80/3(Vol.2))
Micellar-polymer joint demonstration project, Wilmington Field, California, 6:25006 (DOE/BETC/IC—80/3(Vol.2))
Micellar-polymer oil recovery demonstration in the Bell Creek Field, Montana, 6:25009 (DOE/BETC/IC—80/3(Vol.2))
North Burbank Unit tertiary recovery pilot test, 6:25012 (DOE/BETC/IC—80/3(Vol.2))
Penn Grade Micellar Displacement Project, 6:25011 (DOE/BETC/IC—80/3(Vol.2))
Steam Injection
Summary of DEEP STEAM downhole steam generator development activities (Kern River and Long Beach field tests), 6:25035 (SAND—81-0882C)
Waterflooding
Big Muddy low-tension flood process demonstration project, 6:25007 (DOE/BETC/IC—80/3(Vol.2))
Enhanced oil recovery by improved waterflooding in the Storms Pool Field, Illinois, 6:25008 (DOE/BETC/IC—80/3(Vol.2))
Laboratory study of surfactant flooding in the Delaware-Childers field, 6:25001 (DOE/BETC/IC—80/3(Vol.2))
OIL-FILLED CABLES
Cooling
Free and forced convective cooling of pipe-type electric cables. Volume 2: electrohycrodynamic pumping. Final report, 6:25479 (EPRI-EL—1872(Vol.2))
Fluid Mechanics
Free and forced convective cooling of pipe-type electric cables. Volume 1: forced cooling of cables. Final report, 6:25478 (EPRI-EL—1872)
Heat Transfer
Free and forced convective cooling of pipe-type electric cables. Volume 1: forced cooling of cables. Final report, 6:25478 (EPRI-EL—1872)
Pumps
Free and forced convective cooling of pipe-type electric cables. Volume 2: electrohycrodynamic pumping. Final report, 6:25479 (EPRI-EL—1872(Vol.2))

OILS
See also FUEL OILS
SHALE OIL
WASTE OILS
Chemical Composition
Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant, 6:24848 (DOE/ET/13060—T4)
Photoluminescence
Luminescence monitoring of oil or tar contamination for industrial hygiene, 6:26095
Recovery
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section 1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))
OKLAHOMA
Earth-Covered Buildings
Design/development process for Underhill, a residence, 6:25366
Energy performance characteristics of selected earth sheltered residences, 6:25696 (CONF-800438—)
Energy usage in earth covered dwellings in Oklahoma, 6:25739
Implications for habitability design and energy savings in earth sheltered housing, 6:25744
Oklahoma earth shelters: a state-of-the-art review, 6:25697 (CONF-800438—)
ON-LINE CONTROL SYSTEMS
Computer Codes
ADVCON APT postprocessor, 6:26016 (BDX—613-2635)
PTTOPT APT postprocessor, 6:26015 (BDX—613-2634)
OOCYTES
See OVA
OPTICAL EQUIPMENT
Design
Measurement of peak temperature along an optical fiber, 6:26087 (DOE/TIC—1023186)
Machining
Ultraprecision machining of optics at Los Alamos, 6:26021 (LA-UR—81-1962)
Operation
Measurement of peak temperature along an optical fiber, 6:26087 (DOE/TIC—1023186)
OPTICAL MICROSCOPY
Remaining fatigue lifetime prediction for retirement-for-cause in aluminum alloys, 6:25906 (IS-M—315)
OPTOACOUSTIC CELLS
See PHOTOACOUSTIC SPECTROMETERS
ORBITAL SOLAR POWER PLANTS
Environmental Effects
Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments, 6:26437 (DOE/ER/10160—4)
Environmental Impacts
Impact of Satellite Power Systems on the Ionosphere, 6:25294 (DOE/CH/10003—1)
Microwave Power Transmission
Alternate frequency analysis for the solar power system, 6:25295 (DOE/ER/10160—T5)
Impact of Satellite Power Systems on the Ionosphere, 6:25294 (DOE/CH/10003—1)
ORC FLASH PYROLYSIS PROCESS
See OCCIDENTAL FLASH PYROLYSIS PROCESS
ORGANIC COMPOUNDS
See also AMINES
HYDROCARBONS
HYDROXY COMPOUNDS
ORGANIC POLYMERS
ORGANIC SULFUR COMPOUNDS
ORGANOMETALLIC COMPOUNDS
Air Pollution Control
Volatile organic compound (VOC) species data manual. Second edition, 6:26175 (PB—81-119455)
Chemical Preparation
Studies on unusually reactive metal powders. Preparation on new organometallic and organic compounds including potential new catalysts. Progress report, July 1, 1980-March 15, 1981, 6:25991 (DOE/ER/10603—1)
Removal
Biological removal of organic constituents in high-Btu coal gasification wastewaters, 6:24924 (CONF-8006171—1)
Efficacy of activated sludge/powdered activated carbon for removal of organic constituents in wastewater from commercial-scale, high-Btu coal gasification plant, 6:24925 (CONF-8006171—2)
ORGANIC COOLED REACTORS
Coolants
Measuring and controlling the fouling film formation of HB-40 organic coolant, 6:25487
ORGANIC MATTER
See also KEROGEN
PEAT
Biochemical Reaction Kinetics
Effects of acid precipitation on biochemical activities in soil, 6:26335 (CONF-800365—)
Biodegradation
Effects of acidity on decomposition of organic matter in aquatic environments, 6:26282 (CONF-800365—)
ORGANIC POLYMERS
See also PLASTICS
POLYAMIDES
POLYOLEFINS
RUBBERS
THERMOPLASTICS
Mobility
Laboratory study of surfactant flooding in the Delaware-Childers field, 6:25001 (DOE/BETC/IC—80/3(Vol.2))
Polarization
Electrical-to-chemical connection (Polysulfone, polypyromellitimide, polystyrene), 6:25992 (SAND—81-1350C)
Viscosity
Laboratory study of surfactant flooding in the Delaware-Childers field, 6:25001 (DOE/BETC/IC—80/3(Vol.2))
ORGANIC SOLVENTS
Fractionation
Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly progress report, September-November 1980, 6:24858 (DOE/PC/30080—T3)
Liquid Column Chromatography
Reverse phase liquid chromatography of coal liquefaction solvents, 6:25972
Nuclear Magnetic Resonance
Investigation of mechanisms of hydrogen transfer in coal hydrogenation. Quarterly progress report, September-November 1980, 6:24858 (DOE/PC/30080—T3)
ORGANIC SULFUR COMPOUNDS
See also DISULFIDES
SULFONATES
SULFONES
SULFONIC ACIDS
THIOCYANATES
THIOPHENOLS
Chemical Analysis
Evaluation of the removal of organic sulfur from coal, 6:24866 (IS-M—317)
ORGANIC WASTES
Carbon
Obtaining improved products from the organic fraction of municipal solid waste. Final report, 6:25843 (PB—81-110918)
Materials Recovery
Obtaining improved products from the organic fraction of municipal solid waste. Final report, 6:25843 (PB—81-110918)
Recovery
Obtaining improved products from the organic fraction of municipal solid waste. Final report, 6:25843 (PB—81-110918)
ORGANOMETALLIC COMPOUNDS
Chemical Preparation
Studies on unusually reactive metal powders. Preparation on new organometallic and organic compounds including potential new catalysts. Progress report, July 1, 1980-March 15, 1981, 6:25991 (DOE/ER/10603—1)
ORNL
(Oak Ridge National Laboratory.)
Electronic Circuits
Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)

Process Control
Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)
Radiation Monitors
Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)
Reactor Instrumentation
Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)

OSMOTIC POWER PLANTS
See SALINITY GRADIENT POWER PLANTS

OTEC
See OCEAN THERMAL ENERGY CONVERSION

OTEC POWER PLANTS
See OCEAN THERMAL POWER PLANTS

OUTER CONTINENTAL SHELF
See CONTINENTAL SHELF

OVA
Sensitivity
Effects of low pH on hatching of Atlantic salmon eggs, 6:26377 (CONF-800365—)

OXALATES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977

OXALIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908

OXIRANS
See EPOXIDES

OXY MODIFIED IN-SITU PROCESS
Performance
Analysis of the operation of Occidental's Modified In-Situ Retort 6, 6:25087 (UCRL—85312)

OXYGEN
Chemical Reactions
Chemical studies of the Ames oxydesulfurization process, 6:24911
Desulfurization of coal by oxidation in alkaline solutions, 6:24867 (IS-M—318)
Desorption
Chemical makeup of Nb and Nb_3Sn films, 6:25983 (SAND—81-0969C)
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies $\leqq$ 400 MeV, 6:26610 (ORNL/TM—7818)
Production
Air separation by the Moltox process. Interim final report, 6:25797 (DOE/CS/40287—T1)
Load-change testing of a large commercial oxygen plant. Final report, 6:24862 (EPRI-NP—1824)
Recombination
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells. Final report (Hydrogen-oxygen gas recombination device), 6:25583 (ANL/OEPM—80-8)
Uptake
Oxygen uptake and production in sediment-water microcosms, 6:26223

OXYGEN 16
Binding Energy
Applications of moment methods to finite nuclei, 6:26603 (IS-M—320)

OXYGEN 16 REACTIONS
Compound-Nucleus Reactions
High spin structure of ^{75}Br and the (N,Z) dependence of the nuclear deformation in the Br region, 6:26585
Precompound-Nucleus Emission
Precompound emission of light particles in the reaction $^{16}O + ^{238}U$ at 20 MeV/nucleon, 6:26599

OXYGEN 16 TARGET
Electron Reactions
Applications of moment methods to finite nuclei, 6:26603 (IS-M—320)

OXYGEN 17
Energy Levels
Threshold photoneutron angular distribution and polarization studies of nuclei, 6:26591 (CONF-801111—48)

OXYGEN 17 TARGET
Photonuclear Reactions
Threshold photoneutron angular distribution and polarization studies of nuclei, 6:26591 (CONF-801111—48)

OXYGEN 18 TARGET
Pion Plus Reactions
Elastic pion double charge exchange reactions, 6:26578

OXYGEN COMPOUNDS
Chemical Reactions
Oxidations of Illinois No. 6 coal at and below 60°C (Oxidizing agents are sodium hypochlorite, nitric acid and potassium butoxide), 6:24910

OXYGEN EFFECT (RADIOBIOLOGY)
See OXYGEN

OXYGEN PLANTS
Operation
Load-change testing of a large commercial oxygen plant. Final report, 6:24862 (EPRI-NP—1824)
Performance
Load-change testing of a large commercial oxygen plant. Final report, 6:24862 (EPRI-NP—1824)

OXYGENASES
Bioassay
Aryl hydrocarbon mono-oxygenase activity in human lymphocytes, 6:26389 (ORNL/TM—7721)

OZONE
Air Pollution Control
Guideline for use of city-specific EKMA in preparing ozone SIPS. Draft report, 6:26173 (PB—81-118739)
Atmospheric Chemistry
Balance of the tropospheric ozone and its relation to stratospheric intrusions indicated by cosmogenic radionuclides. Technical progress report, November 1, 1980-June 30, 1981, 6:26143 (DOE/ET/03425—21)
Ecological Concentration
Profile of air quality in Region V, 6:26171 (PB—81-116097)
Spatial Distribution
Balance of the tropospheric ozone and its relation to stratospheric intrusions indicated by cosmogenic radionuclides. Technical progress report, November 1, 1980-June 30, 1981, 6:26143 (DOE/ET/03425—21)

P

PACKAGING RULES
Reviews
Packaging configurations and handling requirements for nuclear materials, 6:26018 (CONF-810583—1)

PAINTS
Activation Analysis
Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)
Curing
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)

PALLADIUM
Chemical Preparation
Studies on unusually reactive metal powders. Preparation on new organometallic and organic compounds including potential new catalysts. Progress report, July 1, 1980-March 15, 1981, 6:25991 (DOE/ER/10603—1)
Electronic Structure
Influence of relativistic contributions to the effective potential on the electronic structure of Pd and Pt, 6:25921
Energy Density
Influence of relativistic contributions to the effective potential on the electronic structure of Pd and Pt, 6:25921

Exchange Interactions
Influence of relativistic contributions to the effective potential on the electronic structure of Pd and Pt, 6:25921
PALLADIUM 110 TARGET
Argon 40 Reactions
Observation of giant dipole resonances built on states of high energy and spin, 6:26588
PAPER INDUSTRY
Heat Storage
Industrial thermal-storage applications, 6:25765 (CONF-800272—)
PARABOLIC TROUGH COLLECTORS
Control Systems
Frequency response analysis of fluid control systems for parabolic-trough solar collectors, 6:25387
Mathematical Models
LINSOL: a model for predicting the optical performance of parabolic trough solar thermal systems, 6:25382 (SAND—80-2867C)
Performance
LINSOL: a model for predicting the optical performance of parabolic trough solar thermal systems, 6:25382 (SAND—80-2867C)
PARAFFINS
See ALKANES
PARTICLE BEAM FUSION ACCELERATOR
Monitoring
PBFA I performance monitoring and evaluation system (PMES), 6:26711 (SAND—81-0751C)
PARTICLE PRODUCTION
Meetings
Proceedings of topical workshop on the production of new particles in super high energy collisions, 6:26481
PARTICLE SIZE
Control
Size control of granules in pan and fluidized-bed granulators, 6:25987
PARTICLES
See also DROPLETS
Ecological Concentration
Profile of air quality in Region V, 6:26171 (PB—81-116097)
Thermodynamic Properties
Random-matrix physics: spectrum and strength fluctuations, 6:26606
PARTON MODEL
Reviews
Review on DTU-parton model for hh and hA collisions, 6:26531
PASSIVE SOLAR COOLING SYSTEMS
Financial Incentives
State incentives for passive solar commercialization, 6:25329 (DOE/CS/30245—T1)
Legal Incentives
State incentives for passive solar commercialization, 6:25329 (DOE/CS/30245—T1)
Specifications
Survey of passive solar homes, 6:25345 (HUD-PDR—589)
Surveys
Survey of passive solar homes, 6:25345 (HUD-PDR—589)
PASSIVE SOLAR HEATING SYSTEMS
See also DIRECT GAIN SYSTEMS
Comparative Evaluations
Performance of passive-solar space-heating systems. Comparative report, 1979-1980 heating season, 6:25351 (SOLAR/0022—81/39)
Control Equipment
Enhancing passive solar heating of commercial greenhouses, 6:25353
Design
Oakmead solar buildings, 6:25333 (DOE/CS/31521—T1)
Financial Incentives
State incentives for passive solar commercialization, 6:25329 (DOE/CS/30245—T1)
Legal Incentives
State incentives for passive solar commercialization, 6:25329 (DOE/CS/30245—T1)
Performance
Enhancing passive solar heating of commercial greenhouses, 6:25353
Low temperature solar heating of greenhouses, 6:25355
Performance of passive-solar space-heating systems. Comparative report, 1979-1980 heating season, 6:25351 (SOLAR/0022—81/39)
Specifications
Survey of passive solar homes, 6:25345 (HUD-PDR—589)
Surveys
Survey of passive solar homes, 6:25345 (HUD-PDR—589)
Viability
Application of proactive behavioral techniques for the promotion of solar retrofit in condominiums: the Friars Village case study, 6:25327 (DOE/CS/10210—T1)
PBFA
See PARTICLE BEAM FUSION ACCELERATOR
PCB
See CHLORINATED AROMATIC HYDROCARBONS
PDX DEVICES
Research Programs
Annual report, October 1, 1979-September 30, 1980, 6:26643 (PPPL-Q—38)
PEARL SPAR
See DOLOMITE
PEAT
Resource Assessment
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)
PENNSYLVANIA
Resource Recovery Facilities
Legal and practical aspects of controlling the waste flow: a case study from Delaware County, Pennsylvania, 6:25630 (ANL/CNSV-TM—60)
Wind Power
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)
PEP STORAGE RINGS
(Positron-electron-proton storage ring.)
Magnetic Spectrometers
Superconducting compensator magnets to be used with the HRS spectrometer at the SLAC PEP facility, 6:26068 (CONF-800980—42)
PERCHLORATES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977
PERIDOTITES
Activation Analysis
Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)
PEROXIDES
See also HYDROGEN PEROXIDE
Catalysts
Evaluation of organic peroxides as curing agents for methylphenylvinyl-siloxane elastomers used for cellular silicone cushions, 6:25941 (UCRL—53124)
PERSONNEL
See also DIAL PAINTERS
Radiation Protection
Enhancement of a radiation safety system through the use of a microprocessor-controlled speech synthesizer, 6:26076 (CONF-801103—59)
PERU
Solar Energy
Development of solar energy in Peru, 6:25219 (SAND—81-0764)
PETROLEUM
See also OIL WELLS
SHALE OIL
Chemical Composition
Characterization of fossil liquids, 6:25056 (DOE/BETC/IC—80/3(Vol.4))
Geochemical characterization of petroleum using carbon, sulfur, hydrogen and nitrogen stable isotopes, 6:25055 (DOE/BETC/IC—80/3(Vol.4))

Some useful concepts derived from petroleum component properties for improved waterflooding studies, 6:25027 (DOE/BETC/IC—80/3(Vol.2))
Electrostatic Separation
Electrostatic coalescence system with independent ac and dc hydrophilic electrodes (Patent), 6:25050
Emulsions
Electrostatic coalescence system with independent ac and dc hydrophilic electrodes (Patent), 6:25050
Energy Shortages
Department of Energy's reorganization of Energy contingency planning holds promise - but questions remain, 6:25633 (EMD—81-57)
Enhanced Recovery
Tertiary oil recovery processes research at the University of Texas. Final report, October 1979-September 1980 (Surfactants, phase behavior, interfacial tension, solubilization), 6:24974 (DOE/BC/20001—10)
Fuel Supplies
Long-range oil and gas supply methodology: proposed reformulation, 6:25626 (BNL—51359)
Geochemistry
Geochemical characterization of petroleum using carbon, sulfur, hydrogen and nitrogen stable isotopes, 6:25055 (DOE/BETC/IC—80/3(Vol.4))
Imports
Department of Energy's reorganization of Energy contingency planning holds promise - but questions remain, 6:25633 (EMD—81-57)
Maritime Transport
National petroleum reserve - Alaska: marine transportation system analysis. Executive summary, 6:25048 (PB—81-105033)
National petroleum reserve - Alaska: marine transportation system analysis. Final report, 6:25049 (PB—81-105041)
Origin
Geochemical characterization of petroleum using carbon, sulfur, hydrogen and nitrogen stable isotopes, 6:25055 (DOE/BETC/IC—80/3(Vol.4))
Partition
Development of a rapid and accurate method for determining partition coefficients of chemical tracers between oils and brines (for single well tracer test), 6:24984 (DOE/BETC/IC—80/3(Vol.1))
Phase Studies
Dynamic interfacial properties and their effects on oil ganglia reconnection and displacement processes, 6:25024 (DOE/BETC/IC—80/3(Vol.2))
Optimum surfactant systems for oil recovery, 6:25030 (DOE/BETC/IC—80/3(Vol.2))
Prices
Analysis of alternative-fuel price trajectories, 6:24969 (DOE/RG/10446—T1)
Refining
Effect of enhanced oil recovery chemicals on crude refining, 1979-1980, 6:25039 (DOE/BETC/IC—80/3(Vol.4))
Research Programs
Development of an operational framework for the Liquid Fossil Fuel Cycle (LFFC), 6:26717 (DOE/BETC/IC—80/3(Vol.4))
Processing and utilization. Annual report, October 1, 1979-September 30, 1980, 6:25054 (DOE/BETC/IC—80/3(Vol.4))
Supply Disruption
Policy implications of energy vulnerability, 6:25634

PETROLEUM DEPOSITS
Acoustic Measurements
Cross-borehole seismic probing for petroleum reservoir assessment, 6:24972 (DOE/BETC/IC—80/3(Vol.1))
Leasing
Outer-continental shelf oil and gas leasing policy, 6:25041 (DOE/PE/70278—T14)

PETROLEUM DISTILLATES
Chemical Composition
Characterization of fossil liquids, 6:25056 (DOE/BETC/IC—80/3(Vol.4))
Geochemical characterization of petroleum using carbon, sulfur, hydrogen and nitrogen stable isotopes, 6:25055 (DOE/BETC/IC—80/3(Vol.4))
Liquid Column Chromatography
Reverse phase liquid chromatography of coal liquefaction solvents, 6:25972

PETROLEUM FRACTIONS
See also PETROLEUM DISTILLATES
PETROLEUM RESIDUES
Chemical Composition
Geochemical characterization of petroleum using carbon, sulfur, hydrogen and nitrogen stable isotopes, 6:25055 (DOE/BETC/IC—80/3(Vol.4))

PETROLEUM REFINERIES
Energy Accounting
Energy and materials flows in petroleum refining, 6:25038 (ANL/CNSV—10)

PETROLEUM RESIDUES
Chemical Composition
Characterization of fossil liquids, 6:25056 (DOE/BETC/IC—80/3(Vol.4))

PETROLEUM SULFONATES
Biodegradation
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
Density
Thermodynamic properties of tertiary recovery systems, 6:25059 (DOE/BETC/IC—80/3(Vol.4))
Dielectric Properties
Dielectric relaxation of oil-external microemulsions, 6:25994
Enthalpy
Thermodynamic properties of tertiary recovery systems, 6:25059 (DOE/BETC/IC—80/3(Vol.4))
Phase Studies
Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980, 6:25033 (DOE/BETC/OR—19)
Rock-Fluid Interactions
Adsorption from flooding solutions in porous media: a study of interactions of surfactants and polymers with reservoir minerals, 6:25013 (DOE/BETC/IC—80/3(Vol.2))
Solubility
Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980, 6:25033 (DOE/BETC/OR—19)
Specific Heat
Thermodynamic properties of tertiary recovery systems, 6:25059 (DOE/BETC/IC—80/3(Vol.4))
Toxicity
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))

PHENIX REACTOR
Nuclear Fuels
Depletion analysis and sensitivity study of PHENIX fuel-irradiation experiments, 6:25489 (CONF-810606—56)

PHENOLS
See also NAPHTHOLS
Chemical Composition
Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant, 6:24848 (DOE/ET/13060—T4)
Hydrogenation
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)
Liquid Column Chromatography
Separation and characterization of polycyclic aromatic hydrocarbons and alkylphenols in coal derived solvents, 6:24915
NMR Spectra
Separation and characterization of lignite derived preasphaltenes by gel permeation chromatography and nuclear magnetic resonance spectrometry, 6:24914
Recovery
Demonstration plant engineering and design. Phase I. The pipeline gas demonstration plant. Volume 12. Plant section

1100: gas liquor separation, 6:24846 (DOE/ET/13060—T3(Vol.12))

Solvent Extraction

Pipeline Gas Demonstration Plant: Phase I. Demonstration plant engineering and design. Volume 13. Plant Section 1200, Phenol Extraction, 6:24847 (DOE/ET/13060—T3(Vol.13))

PHENYL ETHER

Chemical Reactions

Coal structure cleavage mechanisms: scission of diphenylmethane and diphenyl ether linkages to hydroxylated rings, 6:24916

PHI4-FIELD THEORY

Effective Range Theory

Numerical computation of the renormalized effective potential in the strong-coupling limit, 6:26528

Feynman Path Integral

Statistical mechanics of kinks and central peak phenomena in phi[4] theory for T< or =T/sub c/, 6:26478

Statistical Mechanics

Statistical mechanics of kinks and central peak phenomena in phi[4] theory for T< or =T/sub c/, 6:26478

Strong-Coupling Model

Strong-coupling expansion for the effective potential on a lattice, 6:26567

PHOSPHATES

Biological Effects

Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238

Ion Exchange Chromatography

Anion chromatography with low-conductivity eluents II, 6:25977

PHOSPHINES

Photolysis

Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines. Progress report, August 16, 1980-April 30, 1981, 6:25996 (DOE/ER/03416—21)

PHOSPHORS

Sensitivity

Lyoluminescent dosimetric materials and their response to ionizing radiation, 6:26084

PHOSPHORUS

Annual Variations

Annual nutrient cycles in a marine microcosm, 6:26242

Biological Effects

Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms, 6:26238

Chemiluminescence

Energy transfer from PO excited states to alkali metal atoms in the phosphorus chemiluminescence flame, 6:25988

Emission Spectroscopy

Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)

Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)

PHOSPHORUS COMPLEXES

Shubnikov-De Haas Effect

Magnetic quantum oscillations in tetramethyltetraselenafulvalene-hexafluorophosphate [$(TMTSF)_2PF_6$], 6:25959

PHOSPHORUS COMPOUNDS

Hyperfine Structure

Moessbauer studies of magnetic ordering amorphous (Fe/sub x/Mn/sub 1-x/)$_{75}P_{16}B_6Al_3$ under extermal magnetic fields, 6:25897 (CONF-801134—16)

PHOSPHORUS OXIDES

Energy Transfer

Energy transfer from PO excited states to alkali metal atoms in the phosphorus chemiluminescence flame, 6:25988

PHOTOACOUSTIC SPECTROMETERS

Design

Simple optoacoustic energy meter for pulsed lasers, 6:26032 (CONF-810630—6)

PHOTOACOUSTIC SPECTROSCOPY

Optimization

Normalizing infrared FT photoacoustic spectra of solids, 6:25960

PHOTOANODES

Fabrication

Efficient and stable photoelectrochemical cells constructed with WSe_2 and $MoSe_2$ photoanodes, 6:25268

PHOTOCHEMICAL ENERGY STORAGE

Research Programs

Organic photochemical storage of solar energy. Progress report, February 1, 1980-January 31, 1981, 6:25248 (DOE/ER/04380—T1)

PHOTOCHEMICAL OXIDANTS

Atmospheric Chemistry

Application of photochemical models. Volume III. Recent sensitivity tests and other applications of the LIRAQ model. Final report, 6:26154 (PB—81-112898)

Environmental Transport

Application of photochemical models. Volume III. Recent sensitivity tests and other applications of the LIRAQ model. Final report, 6:26154 (PB—81-112898)

PHOTODETECTORS

Calibration

Electron photoejection in carbanions. Progress report, July 1, 1980-June 30, 1981, 6:25998 (DOE/ER/10424—1)

PHOTODIODES

Direct bandgap, ionizing radiation insensitive photodiode structures, 6:26089 (SAND—81-0650C)

PHOTODISINTEGRATION

See PHOTONUCLEAR REACTIONS

PHOTOELECTROCHEMICAL CELLS

See also PHOTOELECTROLYTIC CELLS

Corrosion

Investigation of photoelectrochemical corrosion of semiconductors. Final report, 15 April 1980-15 April 1981, 6:25954 (SERI/TR—8002-6-T1)

Efficiency

Efficient and stable photoelectrochemical cells constructed with WSe_2 and $MoSe_2$ photoanodes, 6:25268

Electrical Properties

Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)

Electrodes

Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)

Electrolytes

Electrochemical photovoltaic cells. Project 65039 quarterly technical progress report, November 1, 1980-January 31, 1981, 6:25261 (SERI/PR—9175-1-T3)

Photoanodes

Efficient and stable photoelectrochemical cells constructed with WSe_2 and $MoSe_2$ photoanodes, 6:25268

Novel concepts in electrochemical solar cells. Quarterly technical progress report, December 15, 1980-March 15, 1981, 6:25262 (SERI/PR—9272-1-T1)

Redox Reactions

Novel concepts in electrochemical solar cells. Quarterly technical progress report, December 15, 1980-March 15, 1981, 6:25262 (SERI/PR—9272-1-T1)

Research Programs

Basic research needs and opportunities at the solid-liquid interface, 6:25243 (CONF-8006156—)

PHOTOELECTROLYTIC CELLS

Hydrogen Production

Solar induced water splitting with p/n heterotype photochemical diodes: n-Fe_2O_3/p-GaP, 6:25266

PHOTOGRAPHS

See IMAGES

PHOTOGRAPHY

See also STREAK PHOTOGRAPHY
ULTRAHIGH-SPEED PHOTOGRAPHY

Optimization

Setting up a photographer to do a good job, 6:26714 (UCRL—86304)

Planning
Setting up a photographer to do a good job, 6:26714 (UCRL—86304)

PHOTOLYSIS
Research Programs
Hypersonic beam laser photolysis. Technical progress report, July 15, 1980-March 15, 1981, 6:25997 (DOE/ER/06035—3)

PHOTON ACTIVATION ANALYSIS
See ACTIVATION ANALYSIS

PHOTON DETECTION (X-RAY)
See X-RAY DETECTION

PHOTON TRANSPORT
(For diffusion or transmission of energetic photons in material media.)
Data Compilation
FLUNG: coupled 35-group neutron and 21-group gamma ray, P_3 cross sections for fusion applications, 6:26702 (ORNL/TM—7828)

PHOTON-ATOM COLLISIONS
Fluorescence Spectroscopy
Theoretical studies relating to the interaction of radiation with matter: atomic collision processes occurring in the presence of radiation fields. Annual report No. 3, 1 Aug 79-31 Jul 80, 6:26446 (AD—A-090528)

PHOTON-MOLECULE COLLISIONS
Raman Effect
Critical analysis of theoretical models for the giant Raman effect from adsorbed molecules, 6:26473

PHOTONS
Particle Production
Direct single photon production and a search for diphoton resonance or continuum production at Fermilab energies, 6:26497

PHOTONUCLEAR REACTIONS
Photoneutrons
Threshold photoneutron angular distribution and polarization studies of nuclei, 6:26591 (CONF-801111—48)

PHOTOSYNTHESIS
Biological Models
Model systems in photosynthesis research, 6:26307 (CONF-800963—7)
Phytoplankton studies and nutrient concentrations in the vicinity of the C. P. Crane Generating Station. Final report Jul 79 to Mar 80, 6:26325 (PB—81-114746)
Research Programs
Photochemistry and enzymology of photosynthesis. Progress report, November 1, 1978-May 31, 1981, 6:26308 (DOE/ER/03326—101)

PHOTOVOLTAIC CELLS
See also SOLAR CELLS
Coatings
Basic research needs and opportunities at the solid/solid interface: adhesion, abrasion, and polymer coatings, 6:25245 (CONF-8006156—)
Encapsulation
Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space, 6:25381
Materials
Overview of the solid/solid interface: mechanical stability, 6:25237 (CONF-8006156—)

PHOTOVOLTAIC POWER SUPPLIES
Cost
Solar photovoltaic system engineering perspectives, 6:25256 (SAND—81-1164C)
Electric Batteries
Testing batteries for photovoltaic power systems, 6:25589 (SAND—81-0226C)
Energy Storage
Storage in residential solar total-energy systems, 6:25389 (BNL—51230)
Energy Storage Systems
Cost projections for redox energy-storage systems. Final report, April 30, 1979-September 30, 1979, 6:25666 (DOE/NASA/0126—1)
Flywheel Energy Storage
Testing and evaluation of a solar photovoltaic flywheel energy storage system, 6:25578 (DOE/ET/20279—130)
Inverters
Analysis and test of line-commutated inverters for use in photovoltaic power systems, 6:25296 (DOE/ET/20279—115)
Marketing Research
Market assessment of photovoltaic power systems for agricultural applications in the Philippines, 6:25297 (DOE/NASA/0180—1)
Redox Fuel Cells
NASA preprototype redox storage system for a photovoltaic stand-alone application, 6:25669 (DOE/NASA/12726—8)

PHTHALIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908

PHYTOPLANKTON
See also ALGAE
DIATOMS
Continuous Culture
In situ continuous culturing of lake phytoplankton communities, 6:26233
Entrainment
Phytoplankton studies and nutrient concentrations in the vicinity of the C. P. Crane Generating Station. Final report Jul 79 to Mar 80, 6:26325 (PB—81-114746)
Population Dynamics
Differential effects of growth and loss processes in controlling natural phytoplankton populations, 6:26208 (DOE/EV/01599—T1(Pt.3))
Dissolved organic matter and lake metabolism: biogeochemistry and controls of nutrient flux dynamics in lakes. Technical progress report, 1 July 1980-1 June 1981, 6:26207 (DOE/EV/01599—T1(Pt.1))
Phytoplankton and zooplankton in acidified lakes in South Norway, 6:26379 (CONF-800365—)
Trophic interactions in experimental marine ecosystems perturbed by oil, 6:26396

PIGS
See SWINE

PINES
Photosynthesis
Effect of artificial acid rain on the spectral reflectance and photosynthesis of Scots pine seedlings, 6:26347 (CONF-800365—)
Plant Growth
Effects of artificial acidification with sulfuric acid on tree growth in Scots pine forest, 6:26349 (CONF-800365—)
Sensitivity
Influence of a polluted atmosphere on cuticle degradation in Scots pine (Pinus sylvestris), 6:26341 (CONF-800365—)

PION MINUS REACTIONS
Inelastic Scattering
Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca, 6:26579

PION MINUS-PROTON INTERACTIONS
Charge-Exchange Interactions
Evidence for neutral A_1 and H resonances in charge exchange, 6:26492
Elastic Scattering
High-statistics study of $\pi^+ p$, $\pi^- p$, and pp elastic scattering at 200 GeV/c, 6:26484
Real part of the forward elastic nuclear amplitude for pp, p-barp, $\pi^+ p$, $\pi^- p$, $K^+ p$, and $K^- p$ scattering between 70 and 200 GeV/c, 6:26485
Inclusive Interactions
Anomalous low mass $e^+ e^-$ pair production in 17 GeV/c $\pi^- p$ collisions, 6:26498
Mass Spectra
Search for narrow BB (π) states in 16 GeV/c $\pi^- p$ and 5 GeV/c p-barp interactions, 6:26494
Partial Waves
Evidence for neutral A_1 and H resonances in charge exchange, 6:26492
Particle Production
Diffractive hadroproduction of charmed D mesons, 6:26499

PION PLUS REACTIONS
Charge-Exchange Reactions
Elastic pion double charge exchange reactions, 6:26578
Elastic Scattering
Elastic pion double charge exchange reactions, 6:26578
Inelastic Scattering
Pion inelastic scattering to low-lying states in ^{12}C and ^{40}Ca, 6:26579
PION PLUS-PROTON INTERACTIONS
Angular Distribution
General features of the reaction $\pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$ at 8 GeV/c, 6:26493
Elastic Scattering
High-statistics study of $\pi^+ p$, $\pi^- p$, and pp elastic scattering at 200 GeV/c, 6:26484
Real part of the forward elastic nuclear amplitude for pp, p-barp, $\pi^+ p$, $\pi^- p$, $K^+ p$, and $K^- p$ scattering between 70 and 200 GeV/c, 6:26485
Mass Spectra
General features of the reaction $\pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$ at 8 GeV/c, 6:26493
PION REACTIONS
Inclusive Interactions
Inclusive reactions of pions on nuclei, 6:26575
Scattering Amplitudes
Pauli blocking in the nuclear medium πN transition matrix, 6:26605
PION-DEUTERON INTERACTIONS
Elastic Scattering
Pion-deuteron elastic scattering for momenta from 408 to 600 MeV/c, 6:26491
PION-PROTON INTERACTIONS
Elastic Scattering
Small angle hadron proton elastic scattering at Fermilab energies, 6:26496
PIONS
See also PIONS MINUS
PIONS NEUTRAL
Electroproduction
Mesonic processes in deep-inelastic electron scattering from nuclei, 6:26607
Multiple Production
Evidence for neutral A_1 and H resonances in charge exchange, 6:26492
Observation of charmed F^+ meson produced by neutrino interaction in emulsion, 6:26504
Pair Production
Results on the Y resonances from the CUSB group at CESR, 6:26515
Particle Production
Higher twist QCD terms in high-P/sub T/ pion production, 6:26533
PIONS MINUS
Atom Collisions
Diabatic-state treatment of negative-meson moderation and capture. I. The hydrogen atom, 6:26464
PIONS NEUTRAL
Pair Production
General features of the reaction $\pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$ at 8 GeV/c, 6:26493
PIPELINE QUALITY GAS
See HIGH BTU GAS
PIPELINES
See also ALASKA GAS PIPELINE
NATURAL GAS DISTRIBUTION SYSTEMS
SLURRY PIPELINES
Bottoming Cycles
Pipeline bottoming-cycle study: technological feasibility of the bottoming cycle. Task IIIC report, 6:25823 (GESP—785)
Cathodic Protection
Airborne cathodic-protection surveys, 6:26029
Flowmeters
Ten years with turbine metering, 6:26030
Fracture Properties
Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)
Gas Flow
Ten years with turbine metering, 6:26030
Hydrogen Embrittlement
Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)
Tensile Properties
Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)
Thermal Insulation
New high-temperature guarded hot-box facility for reflective insulation, 6:25761
PIPES
Thermal Insulation
Interlaboratory comparison of the ASTM C 335 pipe insulation test, 6:25759
PITTSBURGH OXYDESULFURIZATION PROCESS
Comparative Evaluations
Evaluation of chemical coal cleaning processes, 6:24954
PLANKTON
See also ICHTHYOPLANKTON
PHYTOPLANKTON
ZOOPLANKTON
Population Dynamics
Acid precipitation: the biotic response in Florida lakes, 6:26363 (CONF-800365—)
PLANNING
Computer Codes
Plotting program for milestone schedules and status reports user's manual, 6:26725 (SAND—80-8053)
PLANT GROWTH
Ecological Succession
Inorganic carbon limitation during ecological succession in aquatic microcosms, 6:26227
PLANT TISSUES
Decomposition
Influence of a polluted atmosphere on cuticle degradation in Scots pine (Pinus sylvestris), 6:26341 (CONF-800365—)
PLANTS
See also ALGAE
CONIFERS
FORAGE
GRASS
TREES
WATER HYACINTHS
WEEDS
Sensitivity
Acid precipitation and soil buffering capacity, 6:26336 (CONF-800365—)
Uptake
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
PLANTS (INDUSTRIAL)
See INDUSTRIAL PLANTS
PLANTS (POWER)
See POWER PLANTS
PLASMA
See also COLLISIONLESS PLASMA
HIGH-BETA PLASMA
LASER-PRODUCED PLASMA
Boltzmann-Vlasov Equation
Hamiltonian field description of the one-dimensional Poisson-Vlasov equations, 6:26640 (PPPL—1788)
Charged-Particle Transport
Expeditions Vlasov solver for computation of ion extraction from a plasma, 6:26665
Magnetohydrodynamics
Force on a moving plasma by a finite conductivity wall, 6:26476
Phase Studies
Phase equilibria for highly unsymmetrical plasmas and electrolytes, 6:26480
Poisson Equation
Hamiltonian field description of the one-dimensional Poisson-Vlasov equations, 6:26640 (PPPL—1788)

PLASMA DIAGNOSTICS
Laser Radiation
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear, 6:26634 (LA—8828-MS)
PLASMA MACROINSTABILITIES
See also BALLOONING INSTABILITY
TEARING INSTABILITY
Larmor Radius
Finite Larmor radius theory of resistive instabilities, 6:26650
PLASMA SHEET
Variations
Substorm-related plasma sheet motions as determined from differential timing of plasma changes at the Isee satellites, 6:26439
PLASMA SIMULATION
Computer simulation of kinetic properties of plasmas. Progress report, July 1, 1980-May 31, 1981, 6:26632 (DOE/ET/53041—13)
PLASTICS
See also ARAMIDS
ORGANIC POLYMERS
POLYACRYLATES
POLYSTYRENE
POLYURETHANES
THERMOPLASTICS
Thermal Conductivity
Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations, 6:25687
PLASTICS INDUSTRY
Solar Process Heat
Haverhill solar energy project: preliminary design report, 6:25331 (DOE/CS/30310—T2)
Haverhill solar energy project: economic analysis, 6:25330 (DOE/CS/30310—T1)
PLATES
(Thicker than SHEETS or FOILS.)
Deformation
Numerical modeling of oblique hypervelocity impact using two-dimensional plane strain models, 6:26023 (SAND—80-2865C)
Impact Shock
Numerical modeling of oblique hypervelocity impact using two-dimensional plane strain models, 6:26023 (SAND—80-2865C)
Stress Analysis
Numerical modeling of oblique hypervelocity impact using two-dimensional plane strain models, 6:26023 (SAND—80-2865C)
PLATES (FUEL)
See FUEL PLATES
PLATINUM
Catalytic Effects
Applications of Fourier transform infrared spectroscopy to in situ catalyst surface studies, 6:25982 (SAND—80-2594C)
Chemical Preparation
Studies on unusually reactive metal powders. Preparation on new organometallic and organic compounds including potential new catalysts. Progress report, July 1, 1980-March 15, 1981, 6:25991 (DOE/ER/10603—1)
Electronic Structure
Influence of relativistic contributions to the effective potential on the electronic structure of Pd and Pt, 6:25921
Energy Density
Influence of relativistic contributions to the effective potential on the electronic structure of Pd and Pt, 6:25921
Exchange Interactions
Influence of relativistic contributions to the effective potential on the electronic structure of Pd and Pt, 6:25921
PLATINUM 194 TARGET
Triton Reactions
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
PLATINUM 196 TARGET
Triton Reactions
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
PLATINUM 198 TARGET
Triton Reactions
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
PLT DEVICES
(Princeton Large Torus.)
Research Programs
Annual report, October 1, 1979-September 30, 1980, 6:26643 (PPPL-Q—38)
PLUMES
Diffusion
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume I. Dispersion from single and multiple source natural draft cooling towers. Technical report, 6:25459 (NUREG/CR—1581-V-1)
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 3. Plume rise from mechanical draft cooling towers. Technical report, 6:25461 (NUREG/CR—1581-V-3)
Remarks on the description of the statistical features of the turbulent diffusion of a puff, 6:26105 (BNL—51386)
Mixing
Modeling of heated surface jets. Final technical report, 6:26295 (PB—81-116857)
Turbulence
Description of the turbulent fragmentation of a puff in the turbulent flow with the large Reynold's numbers, 6:26104 (BNL—51385)
PLUTONIUM
Calorimetry
Gamma-ray measurements for simultaneous calorimetric assay, 6:25969 (MLM—2840(OP))
Gamma Spectroscopy
Gamma-ray measurements for simultaneous calorimetric assay, 6:25969 (MLM—2840(OP))
Radioecological Concentration
Measurements of the oxidation state and concentration of plutonium in interstitial waters of the Irish Sea, 6:26291 (CONF-801063—6)
Radionuclide Migration
Measurements of the oxidation state and concentration of plutonium in interstitial waters of the Irish Sea, 6:26291 (CONF-801063—6)
Valence
Measurements of the oxidation state and concentration of plutonium in interstitial waters of the Irish Sea, 6:26291 (CONF-801063—6)
PLUTONIUM ISOTOPES
Isotope Ratio
Portable computer to reduce gamma-ray spectra for plutonium isotopic ratios, 6:25174 (UCRL—53145)
PLUTONIUM OXIDES
Chemical Analysis
Gamma-ray measurements for simultaneous calorimetric assay, 6:25969 (MLM—2840(OP))
PNA
See POLYCYCLIC AROMATIC HYDROCARBONS
POINT CONTACTS
See ELECTRIC CONTACTS
POINT POLLUTANT SOURCES
Health Hazards
Epidemiology, public health, and health surveillance around point sources of pollution, 6:26314
Radiation Hazards
Epidemiology, public health, and health surveillance around point sources of pollution, 6:26314
POISSON EQUATION
Hamiltonian field description of the one-dimensional Poisson-Vlasov equations, 6:26640 (PPPL—1788)
POLAND
Research Programs
East Europe report: scientific affairs, No. 706, 6:26715 (JPRS—78269)
POLLUTION
(For nonradioactive pollution only; see also CONTAMINATION.)
See also AIR POLLUTION

CHEMICAL EFFLUENTS
LAND POLLUTION
THERMAL POLLUTION
WATER POLLUTION

Environmental Transport
Development and application of terrestrial food chain models to assess health risks to man and releases of pollutants to the environment, 6:26192 (IAEA-SM—254/63)

Radionuclide Migration
Development and application of terrestrial food chain models to assess health risks to man and releases of pollutants to the environment, 6:26192 (IAEA-SM—254/63)

POLLUTION CONTROL EQUIPMENT
See also AIR FILTERS
ELECTROSTATIC PRECIPITATORS
SCRUBBERS

Technology Assessment
Development document for proposed effluent limitations guidelines, new source performance standards, and pretreatment standards for the steam electric point source category. Interim report, 6:25469 (PB—81-119075)

POLLUTION REGULATIONS

Enforcement
Relaxing environmental standards during oil-supply disruptions: past, present and future, 6:26172 (DOE/PE/70278—T15)

POLONIUM 199

Isomeric Transitions
Decay of /sup 199m,g/Po: isomeric transitions in ^{199}Po and ^{199}Bi, 6:26592 (CONF-810649—6)

POLORIDAL DIVERTOR EXPERIMENT
See PDX DEVICES

POLYACRYLATES

Combustion Properties
Soot volume-fraction profiles in a free-combusting boundary layer, 6:26011 (LBL—12767)

Compression
Shock compression temperature rise determined from resistivity of embedded metal foils (Polymethyl methacrylate), 6:25940 (SAND—80-2836C)

POLYAMIDES
See also POLYURETHANES

Biodegradation
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
Development of improved mobility control agents for surfactant/polymer flooding, 6:25018 (DOE/BETC/IC—80/3(Vol.2))

Rheology
Development of improved mobility control agents for surfactant/polymer flooding, 6:25018 (DOE/BETC/IC—80/3(Vol.2))
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))

Shear Properties
Development of improved mobility control agents for surfactant/polymer flooding, 6:25018 (DOE/BETC/IC—80/3(Vol.2))

Synthesis
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))

Toxicity
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
Toxicity of chemical compounds used in enhanced oil recovery, 6:25040 (DOE/BETC/IC—80/3(Vol.1))

Viscosity
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))

POLYCYCLIC AROMATIC HYDROCARBONS

Biological Indicators
Aryl hydrocarbon mono-oxygenase activity in human lymphocytes, 6:26389 (ORNL/TM—7721)

Chromatography
Separation and characterization of polycyclic aromatic hydrocarbons and alkylphenols in coal derived solvents, 6:24915

Diffusion
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)

Hydrogenation
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)

Liquid Column Chromatography
Separation and characterization of polycyclic aromatic hydrocarbons and alkylphenols in coal derived solvents, 6:24915

Thermodynamic Properties
Thermodynamic characterization of condensed-ring compounds, 6:25990 (DOE/BETC/IC—80/3(Vol.4))

Thin-Layer Chromatography
Separation and characterization of polycyclic aromatic hydrocarbons and alkylphenols in coal derived solvents, 6:24915

POLYMER FLOODING
See MICROEMULSION FLOODING

POLYNUCLEAR HYDROCARBONS
See CONDENSED AROMATICS

POLYOLEFINS
See also POLYPROPYLENE
POLYSTYRENE

Aging
Experimental techniques for investigating the degradation of electrical insulation. Final report, 6:25473 (EPRI-EL—1854)

Materials Testing
Experimental techniques for investigating the degradation of electrical insulation. Final report, 6:25473 (EPRI-EL—1854)

POLYPROPYLENE

Chemical Radiation Effects
Kinetics of free radical decay reactions in irradiated isotactic polypropylene (Gamma rays), 6:26004

Pyrolysis
Conversion of atactic polypropylene waste to fuel oil, 6:25773 (CONF-800272—)

POLYSACCHARIDES
See also CELLULOSE
DEXTRAN
LIGNIN
Micellar-flood research: biopolymers, interfacial and phase behavior, and competitive adsorbates, 6:25020 (DOE/BETC/IC—80/3(Vol.2))

Biodegradation
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
Development of improved mobility control agents for surfactant/polymer flooding, 6:25018 (DOE/BETC/IC—80/3(Vol.2))

Rheology
Development of improved mobility control agents for surfactant/polymer flooding, 6:25018 (DOE/BETC/IC—80/3(Vol.2))

Shear Properties
Development of improved mobility control agents for surfactant/polymer flooding, 6:25018 (DOE/BETC/IC—80/3(Vol.2))

Toxicity
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
Toxicity of chemical compounds used in enhanced oil recovery, 6:25040 (DOE/BETC/IC—80/3(Vol.1))

POLYSTYRENE

Polarization
Electrical-to-chemical connection (Polysulfone, polypyromellitimide, polystyrene), 6:25992 (SAND—81-1350C)

Thermal Conductivity
Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations, 6:25687

POLYSULFIDES
See SULFIDES

POLYURETHANES
Thermal Conductivity
Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations, 6:25687

PONDS
See LAKES

POPULATION DYNAMICS
Forecasting
Limitations on the use of microcosms for predicting algal response to nutrient enrichment in lotic systems, 6:26239
Temperature Effects
Effects of temperature on periphyton biomass and community composition in the Browns Ferry experimental channels, 6:26328

POPULATIONS
See also HUMAN POPULATIONS
Biological Adaptation
Fish in naturally acidic lakes of northern Wisconsin, USA, 6:26380 (CONF-800365—)

POROUS MATERIALS
Energy Transport
Modeling of water and solute transport under variably saturated conditions: state of the art (347 references), 6:25112 (CONF-801217—)
Fluid Flow
New concepts for enhancing petroleum recovery, 6:25025 (DOE/BETC/IC—80/3(Vol.2))
Relative permeability of low tension systems at elevated temperatures, 6:25026 (DOE/BETC/IC—80/3(Vol.2))
Surfactant synthesis, polymer buffer and surfactant slug design for the tertiary recovery of the Pennsylvania grade crude oil, 6:25021 (DOE/BETC/IC—80/3(Vol.2))
Use of similarity methods in evaluation of reservoir simulators, 6:24989 (DOE/BETC/IC—80/3(Vol.1))
Heat Transfer
Influence of moisture and moisture gradients on heat transfer through porous building materials, 6:25752
Numerical study of natural convection in a horizontal porous layer subjected to an end-to-end temperature difference, 6:26043
Mass Transfer
Modeling of water and solute transport under variably saturated conditions: state of the art (347 references), 6:25112 (CONF-801217—)
Multiphase Flow
Environmental aspects and fluid flow characteristics of EOR systems, 6:25047 (DOE/BETC/IC—80/3(Vol.1))
Permeability
Interfacial effects in the recovery of residual oil by displacement: studies at Northwestern University, 6:25019 (DOE/BETC/IC—80/3(Vol.2))
Relative permeability of low tension systems at elevated temperatures, 6:25026 (DOE/BETC/IC—80/3(Vol.2))
Radionuclide Migration
Modeling contaminant transport in porous media in relation to nuclear-waste disposal: a review, 6:25110 (CONF-801217—)
Structural Models
Interfacial effects in the recovery of residual oil by displacement: studies at Northwestern University, 6:25019 (DOE/BETC/IC—80/3(Vol.2))
Two-Phase Flow
Water coning in porous media reservoirs for compressed air energy storage, 6:25572 (PNL—3470)

PORTLAND CEMENT
Production
Technical and marketing issues affecting the use of RDF as kiln fuel, 6:25204 (ANL/CNSV-TM—60)

PORTSMOUTH CENTRIFUGE ENRICHMENT PLANT
Accounting
Hexapartite safeguards project team 3: material accounting and control questionnaire, 6:25172 (K/OA—5001)

POSITRONS
Annihilation
Temperature dependence of the Doppler-broadened positron annihilation spectra in single and polycrystalline Cd, 6:25925

POTASSIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Energy Transfer
Energy transfer from PO excited states to alkali metal atoms in the phosphorus chemiluminescence flame, 6:25988
Ion Collisions
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)
Mass Transfer
Microcracks and energy. Progress report, April 1, 1980-February 28, 1981, 6:25089 (DOE/ER/04972—1)
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies $\leqq$ 400 MeV, 6:26610 (ORNL/TM—7818)
Oscillator Strengths
Oscillator strength for principal series transitions to the high Rydberg states of potassium, 6:26468
Photoionization
Oscillator strength for principal series transitions to the high Rydberg states of potassium, 6:26468

POTASSIUM CHLORIDES
Argon 40 Reactions
Correlations at small relative momenta among protons produced in collisions of 1.8 GeV/nucleon ^{40}Ar with a KCl target, 6:26488

POTASSIUM COMPOUNDS
Chemical Reactions
Oxidations of Illinois No. 6 coal at and below 60°C (Oxidizing agents are sodium hypochlorite, nitric acid and potassium butoxide), 6:24910
Phase Studies
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))

POTASSIUM OXIDES
Phase Transformations
Raman scattering studies of the impurity-induced ferroelectric phase transition in $KTaO_3$:Li, 6:25958

POTASSIUM PERMANGANATES
Chemical Reactions
Novel method for controlled oxidation, 6:24908

POTTING MATERIALS
Dielectric Properties
Quantitative method for photovoltaic encapsulation system optimization, 6:25278
Optical Properties
Quantitative method for photovoltaic encapsulation system optimization, 6:25278
Stresses
Quantitative method for photovoltaic encapsulation system optimization, 6:25278
Thermal Analysis
Quantitative method for photovoltaic encapsulation system optimization, 6:25278

POWER DISTRIBUTION
Automation
Field demonstrations of communication systems for distribution automation. Final report, 6:25475 (EPRI-EL—1860(Vol.3))
Field demonstrations of communication systems for distribution automation. Final report, 6:25474 (EPRI-EL—1860(Vol.2))
Data Acquisition Systems
Field demonstrations of communication systems for distribution automation. Final report, 6:25475 (EPRI-EL—1860(Vol.3))

POWER DISTRIBUTION SYSTEMS
Automation
Broadcast radio system for distribution communications. Final report, 6:25477 (EPRI-EL—1868)
Field demonstrations of communication systems for distribution automation. Final report, 6:25476 (EPRI-EL—1860(Vol.4))
Control Systems
Broadcast radio system for distribution communications. Final report, 6:25477 (EPRI-EL—1868)
Field demonstrations of communication systems for distribution automation. Final report, 6:25476 (EPRI-EL—1860(Vol.4))
POWER GENERATION
See also COGENERATION
Energy Sources
Perspective on alternative electric power sources, 6:25822
POWER PLANT AND INDUSTRIAL FUEL USE ACT
Fuel Substitution
Analysis of alternative-fuel price trajectories, 6:24969 (DOE/RG/10446—T1)
POWER PLANTS
See also DUAL-PURPOSE POWER PLANTS
FUEL CELL POWER PLANTS
MHD POWER PLANTS
THERMAL POWER PLANTS
THERMONUCLEAR POWER PLANTS
WIND POWER PLANTS
Air Pollution
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 2. Salt drift deposition from natural draft cooling towers. Technical report, 6:25460 (NUREG/CR—1581-V-2)
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 3. Plume rise from mechanical draft cooling towers. Technical report, 6:25461 (NUREG/CR—1581-V-3)
Prediction of air quality impacts for stack emissions from the proposed Vienna unit No. 9, 6:25463 (PB—81-109720)
Environmental Effects
Ecological investigations at power plant cooling lakes, reservoirs, and ponds: an annotated bibliography. Final report, 6:26324 (EPRI-EA—1874)
Environmental effects of western coal combustion. Part III. The water quality of Rosebud Creek, Montana. Final report, 6:24937 (PB—81-113615)
Power plant induced rainfall modification: Fact or fiction?, 6:26170
Thermal effects on primary productivity of phytoplankton, periphyton and macrophytes in Lake Keowee, South Carolina. Report for 1 Jul 72-30 Jun 76, 6:25466 (PB—81-112435)
Thermal stress studies on selected zooplankton species and an isopod, 6:26326 (PB—81-115610)
Environmental Impacts
Chalk Point steam electric station studies Patuxent Estuary studies: ichthyoplankton population studies, 1979. Final report, 6:25465 (PB—81-111312)
Inventories
Inventory of power plants in the United States. 1980 annual, 6:25435 (DOE/EIA—0095(80))
POWER POOLS
See INTERCONNECTED POWER SYSTEMS
POWER SUBSTATIONS
Control Systems
Field demonstrations of communication systems for distribution automation. Final report, 6:25475 (EPRI-EL—1860(Vol.3))
Field demonstrations of communication systems for distribution automation. Final report, 6:25474 (EPRI-EL—1860(Vol.2))
Data Acquisition Systems
Field demonstrations of communication systems for distribution automation. Final report, 6:25474 (EPRI-EL—1860(Vol.2))
POWER SUPPLIES
See also PHOTOVOLTAIC POWER SUPPLIES
SPACECRAFT POWER SUPPLIES
Operation of the new Hermes II Marx, 6:26710 (SAND—81-0750C)
POWER SYSTEMS
See also AC SYSTEMS
INTERCONNECTED POWER SYSTEMS
Transformers
Study to improve transmission system availability and utilization through identification of critical parameters and transformer performance analysis. Final technical report, 6:25472 (DOE/ET/29356—6)
POWER TRANSMISSION LINES
Electric Potential
Tester line voltage monitor, 6:25471 (BDX—613-2449)
Electrical Insulators
Crystallized fly-ash feasibility study. Final report, 6:25802 (EPRI-EL—1836)
Health Hazards
Assessment of health impacts from electrical-power transmission lines, 6:26401 (UR—3490-2024)
PRECIPITATIONS (ATMOSPHERIC)
See ATMOSPHERIC PRECIPITATIONS
PREPARATION (CHEMICAL)
See CHEMICAL PREPARATION
PRESSURE (VAPOR)
See VAPOR PRESSURE
PRESSURIZED WATER REACTORS
See PWR TYPE REACTORS
PRINCETON LARGE TORUS
See PLT DEVICES
PRINTED CIRCUITS
Materials Testing
Testing multilayer printed wiring board prepreg by differential-scanning calorimetry. Final report, 6:26049 (BDX—613-2626)
PROCESS CONTROL
Research Programs
Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)
PROCESSING
Energy Audits
Practical energy auditing, 6:25714 (CONF-7910214—)
PROCESSING (WASTES)
See WASTE PROCESSING
PRODUCTION (HYDROGEN)
See HYDROGEN PRODUCTION
PRODUCTIVITY
Economic Impact
Sources of deep-coal-mine productivity change, 1962 to 1975, 6:25635
PROMETHAZINE
See AMINES
PROPANOLS
Phase Studies
Studies of aqueous solutions and microemulsions for enhanced oil recovery processes, 6:25053 (DOE/BETC/IC—80/3(Vol.2))
PROPENE
See PROPYLENE
PROPIONIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908
PROPYLENE
Brayton Cycle
Some heat engine cycles in which liquids can work, 6:26624
Stirling Cycle
Some heat engine cycles in which liquids can work, 6:26624
PROTON REACTIONS
P Invariance
Parity violation in proton-nucleus scattering at 6 GeV/c, 6:26502
Pickup Reactions
Nuclei far from stability using exotic targets, 6:26589 (LA-UR—81-1593)
Total Cross Sections
Nuclear cross sections for light ions on ^{6}Li (100 keV to several MeV), 6:26577 (CONF-801111—47)
PROTON-ANTIPROTON INTERACTIONS
Annihilation
Review on DTU-parton model for hh and hA collisions, 6:26531

Elastic Scattering
Real part of the forward elastic nuclear amplitude for pp, p-barp, π^+p, π^-p, K^+p, and K^-p scattering between 70 and 200 GeV/c, 6:26485
Mass Spectra
Search for narrow BB (π) states in 16 GeV/c π^-p and 5 GeV/c p-barp interactions, 6:26494
Particle Production
New quark and weak boson signatures at p-barp colliders, 6:26536

PROTON-NEUTRON INTERACTIONS
Analyzing Power
Zero-crossing angle in the np analyzing power at medium energies and its relation to charge symmetry, 6:26576
Total Cross Sections
Measurement of the difference in pn total cross sections in pure longitudinal spin states, 6:26489
Measurement of the difference in pn total cross sections in pure longitudinal spin states, 6:26490

PROTON-PROTON INTERACTIONS
Elastic Scattering
High-statistics study of π^+p, π^-p, and pp elastic scattering at 200 GeV/c, 6:26484
Real part of the forward elastic nuclear amplitude for pp, p-barp, π^+p, π^-p, K^+p, and K^-p scattering between 70 and 200 GeV/c, 6:26485
Small angle hadron proton elastic scattering at Fermilab energies, 6:26496
Particle Production
Direct single photon production and a search for diphoton resonance or continuum production at Fermilab energies, 6:26497

PROTONS
Particle Production
Correlations at small relative momenta among protons produced in collisions of 1.8 GeV/nucleon ^{40}Ar with a KCl target, 6:26488

PROTOZOA
See also AMOEBA
ZOOPLANKTON
Growth
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
Population Dynamics
Microbiocoenoses in an Antarctic pond, 6:26230
Responses of aquatic microcosms to acute mortality, 6:26234

PSI RESONANCES
Photoproduction
Measurement of the J/psi photoproduction cross section, 6:26501

PSI-3105 RESONANCES
Radiative Decay
Radiative transitions from the psi(3095) and psi'(3684) to ordinary hadrons, 6:26514

PSI-3695 RESONANCES
Radiative Decay
Radiative transitions from the psi(3095) and psi'(3684) to ordinary hadrons, 6:26514

PUBLIC BUILDINGS
Solar Space Heating
Solar-energy-system performance evaluation: Dallas Recreation Center, Dallas, Texas. March-November 1980, 6:25352 (SOLAR/2038—81/14)
Solar Water Heating
Solar-energy-system performance evaluation: Dallas Recreation Center, Dallas, Texas. March-November 1980, 6:25352 (SOLAR/2038—81/14)

PUBLIC UTILITIES
See also ELECTRIC UTILITIES
Information Dissemination
Quarterly project status report, April-June 1981, 6:25640 (DOE/RG/10367—T3)

PULSE GENERATORS
Pulse power applications of flux compression generators, 6:26635 (LA-UR—81-1601)

PUMP TURBINES
Computerized Simulation
Small hydro plant development program (PTMDL computer code), 6:25212 (DOE/ID/01570—T21Vol.3App.L)
Economic Analysis
Small hydro plant development program. Volume 1. Text, 6:25209 (DOE/ID/01570—T21(Vol.1))
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)
Performance
Small hydro plant development program. Volume 1. Text, 6:25209 (DOE/ID/01570—T21(Vol.1))
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)

PUMPED STORAGE
Site Surveys
In situ premeability measurements for an underground compressed air storage project, 6:26407 (LBL—12076)

PUMPED STORAGE POWER PLANTS
Environmental Impacts
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 10. Environmental studies. Final report, 6:25576 (EPRI-EM—1589(Vol.10))
Geological Surveys
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 6. Site investigation: shallow drilling. Final report, 6:25568 (EPRI-EM—1589(Vol.6))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 7. Site investigation: deep drilling. Final report, 6:25569 (EPRI-EM—1589(Vol.7))
Hoists
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix C. Heavy hoist. Final report, 6:25210 (EPRI-EM—1589(Vol.8)(App.C))
Licensing
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 13. CAUPH preliminary licensing documentation. Final report, 6:25213 (EPRI-EM—1589(Vol.13))
Materials Handling
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix C. Heavy hoist. Final report, 6:25210 (EPRI-EM—1589(Vol.8)(App.C))
Regulations
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 13. CAUPH preliminary licensing documentation. Final report, 6:25213 (EPRI-EM—1589(Vol.13))
Safety
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 10. Environmental studies. Final report, 6:25576 (EPRI-EM—1589(Vol.10))
Site Selection
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 6. Site investigation: shallow drilling. Final report, 6:25568 (EPRI-EM—1589(Vol.6))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 7. Site investigation: deep drilling. Final report, 6:25569 (EPRI-EM—1589(Vol.7))
Water Reservoirs
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix A. Upper reservoir. Final report, 6:25574 (EPRI-EM—1589(Vol.8)(App.A))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix E. Lower reservoir. Final report, 6:25575 (EPRI-EM—1589(Vol.8)(App.E))

PUMPS
See also VACUUM PUMPS
WATER PUMPS
WIND-POWERED PUMPS
Availability
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)
Economics
Economic analysis of wind energy for irrigation pumping, 6:25430
Irrigation
Economic analysis of wind energy for irrigation pumping, 6:25430
Operation
Free and forced convective cooling of pipe-type electric cables. Volume 2: electrohycrodynamic pumping. Final report, 6:25479 (EPRI-EL—1872(Vol.2))
Performance
Free and forced convective cooling of pipe-type electric cables. Volume 2: electrohycrodynamic pumping. Final report, 6:25479 (EPRI-EL—1872(Vol.2))
Wind assisted deep-well pumping, 6:25429
PUROX PYROLYSIS PROCESS
PUROX system demonstration test on simulated Japanese refuse, 6:25188
PWR TYPE REACTORS
See also LOFT REACTOR
SHIPPINGPORT REACTOR
THREE MILE ISLAND-2 REACTOR
TURKEY POINT-3 REACTOR
TURKEY POINT-4 REACTOR
Containment Systems
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Engineered Safety Systems
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Failure Mode Analysis
Methods of hazard analysis and nuclear safety engineering, 6:25542
Fault Tree Analysis
Methods of hazard analysis and nuclear safety engineering, 6:25542
Fuel Cycle
Resource consequences of reenrichment versus blending, 6:25500 (HEDL-SA—2322-FP)
Loss of Coolant
Comparisons of TRAC-PD2 calculations with Semiscale Mod-3 small-break tests, 6:25530 (LA-UR—81-1520)
Pretest and posttest calculations of Semiscale Test S-07-10D with the TRAC computer program, 6:25532 (LA-UR—81-1556)
Special small-break applications with TRAC, 6:25529 (LA-UR—81-1519)
Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region, 6:25522 (CONF-810801—3(Summ.))
TRAC methods and models, 6:25528 (LA-UR—81-1498)
TRAC-PD2 modeling of LOFT and PWR small cold-leg breaks, 6:25531 (LA-UR—81-1521)
Reactor Accidents
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Reactor Materials
Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region, 6:25522 (CONF-810801—3(Summ.))
Reactor Protection Systems
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Reactor Safety
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Risk Assessment
Methods of hazard analysis and nuclear safety engineering, 6:25542
Spent Fuels
Resource consequences of reenrichment versus blending, 6:25500 (HEDL-SA—2322-FP)
PYRENE
Hydrogenation
Chemistry and catalysis of coal liquefaction: catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, October-December 1980, 6:24849 (DOE/ET/14700—5)
PYRITE
Dielectric Properties
Analysis of dielectric heating and conductive cooling of pyrite in coal, 6:24948 (IS-M—311)
PYROLYSIS
See also CALCINATION
Chemical Reaction Kinetics
Kinetics of lignite pyrolysis in an entrained-flow, isothermal furnace, 6:24886
Waste Product Utilization
Conversion of atactic polypropylene waste to fuel oil, 6:25773 (CONF-800272—)
PYROLYTIC GASES
Chemical Composition
Gasification engineering. Quarterly report, January-March 1981, 6:25185 (SERI/PR—622-1153)
Gas Yields
Gasification engineering. Quarterly report, January-March 1981, 6:25185 (SERI/PR—622-1153)
Methanation
Engineering economic analysis of biomethanation of pyrolysis gas, 6:25181 (DOE/CE/20098—1)
PYROLYTIC OILS
Production
Pyrolytic oils - characterization and data development for continuous processing. Report for Jun 76-Mar 80, 6:25184 (PB—81-110959)

Q

QUADRICYCLENE
Photochemical Energy Storage
Organic photochemical storage of solar energy. Progress report, February 1, 1980-January 31, 1981, 6:25248 (DOE/ER/04380—T1)
QUALITY OF LIFE
Forecasting
Energy choices in a democratic society. Supporting paper 7, 6:25602 (PB—81-114852)
QUANTUM CHROMODYNAMICS
Topics in the theory of heavy-quark systems, 6:26520 (LBL—12558)
Deep Inelastic Scattering
Quantum chromodynamics and deep-inelastic scattering, 6:26552
Electron-Positron Interactions
TASSO results on jets and QCD, 6:26513
Hadron-Hadron Interactions
QCD corrections to hadronic large p/sub T/ scattering, 6:26532
Jets
Jet expectations for near future facilities, 6:26555
Perturbation Theory
Components of QCD, 6:26572
Quark-Antiquark Interactions
Higher twist QCD terms in high-P/sub T/ pion production, 6:26533
Structure Functions
Quantum chromodynamics and deep-inelastic scattering, 6:26552
Structure functions and high twist contributions in perturbative quantum chromodynamics, 6:26548
Structure functions and high twist contributions in perturbative quantum chromodynamics, 6:26553
Testing
Using e^+e^- cross-sections to test QCD and to search for new particles, 6:26549

Weinberg-Salam Gauge Model
Fun with W, Z, H, and G's, 6:26573
QUANTUM FLAVORDYNAMICS
Supersymmetry
Sequential internal supersymmetry, 6:26562
QUANTUM MECHANICS
Wigner Theory
Errors in the Wigner approach to quantum dynamics, 6:26621
QUARK CONFINEMENT
See BAG MODEL
QUARK MODEL
Topics in the theory of heavy-quark systems, 6:26520 (LBL—12558)
Configuration Mixing
Magnetic moments of quarks in baryons and mesons, 6:26510
CP Invariance
CP violation in the six-quark model, 6:26561
Magnetic Moments
Magnetic moments of quarks in baryons and mesons, 6:26510
QUARK-ANTIQUARK INTERACTIONS
Inverse Scattering Problem
Inverse scattering and the Y family, 6:26550
QUARKONIUM
Energy Levels
Inverse scattering and the Y family, 6:26550
Hadronic Particle Decay
QCD corrections to quarkonia decays, 6:26551
Potentials
Topics in the theory of heavy-quark systems, 6:26520 (LBL—12558)
Quantum Chromodynamics
Quarkonia and quantum chromodynamics, 6:26523
QUARKS
Charge Density
Can quarks have integer charge?, 6:26525
Pair Production
Gluon fusion, 6:26535
Particle Production
New quark and weak boson signatures at p-barp colliders, 6:26536
Photoproduction
Leptoproduction of heavy quarks, 6:26534
Quantum Flavordynamics
Quark flavor mixing and its physical implications, 6:26547
QUATERNARY COMPOUNDS
Electric Conductivity
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Thermodynamic Properties
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)
Viscosity
Treatment of ionic solutions over the entire miscibility range, 6:25980 (LBL—12761)

R

RACIAL GROUPS
See MINORITY GROUPS
RADIATION BELTS
Dynamics
Dynamics of energetic electrons in the earth's outer radiation belt during 1968 as observed by the Lawrence Livermore National Laboratory's spectrometer on Ogo 5, 6:26442
Electrons
Dynamics of energetic electrons in the earth's outer radiation belt during 1968 as observed by the Lawrence Livermore National Laboratory's spectrometer on Ogo 5, 6:26442
RADIATION DECONTAMINATION
See DECONTAMINATION
RADIATION DETECTORS
See also NEUTRON DETECTORS
RADIATION MONITORS
RADIOMETERS
SEMICONDUCTOR DETECTORS
SPECTROMETERS
Performance
Initial neutron and gamma air-earth interface measurements. Final report, 6:26101 (AD—464381)
Physical Radiation Effects
Evaluation of military radiac equipment, 6:26100 (AD—460281)
RADIATION DOSEMETERS
See DOSEMETERS
RADIATION DOSES
Mathematical Models
Continuous-release formulation for environmental doses to moving receptors, 6:26166 (HEDL-SA—2302)
RADIATION DOSIMETRY
See DOSIMETRY
RADIATION EXPOSURE (DOSES)
See RADIATION DOSES
RADIATION HAZARDS
Alarm Systems
Enhancement of a radiation safety system through the use of a microprocessor-controlled speech synthesizer, 6:26076 (CONF-801103—59)
RADIATION MONITORING
Quality Assurance
DOE-OES-EML quality assurance program, 6:26168
RADIATION MONITORS
Ge Semiconductor Detectors
Remote detection system, 6:26078 (LA—8814-MS)
He-3 Counters
Remote detection system, 6:26078 (LA—8814-MS)
Research Programs
Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)
Specifications
Remote detection system, 6:26078 (LA—8814-MS)
RADIO EQUIPMENT
See also COMMUNICATIONS
TELEVISION
Operation
Broadcast radio system for distribution communications. Final report, 6:25477 (EPRI-EL—1868)
Field demonstrations of communication systems for distribution automation. Final report, 6:25476 (EPRI-EL—1860(Vol.4))
Performance
Broadcast radio system for distribution communications. Final report, 6:25477 (EPRI-EL—1868)
Field demonstrations of communication systems for distribution automation. Final report, 6:25476 (EPRI-EL—1860(Vol.4))
Switching Diodes
Resonant mode PIN switch, 6:26053
RADIO RECEIVERS
See RADIO EQUIPMENT
RADIO TRANSMITTERS
See RADIO EQUIPMENT
RADIOACTIVE AEROSOLS
Distribution
Dispersion of radioactive pollutant in a tornadic storm, 6:26165 (DP—1556)
RADIOACTIVE BIOLOGICAL WASTES
See RADIOACTIVE WASTES
RADIOACTIVE EFFLUENTS
See also RADIOACTIVE WASTES
Diffusion
Continuous-release formulation for environmental doses to moving receptors, 6:26166 (HEDL-SA—2302)
Radiation Monitoring
Radionuclides in liquid effluents from Argonne National Laboratory: an example of monitoring for a multidisciplinary nuclear laboratory, 6:26292
Radioecological Concentration
Radionuclides in liquid effluents from Argonne National Laboratory: an example of monitoring for a multidisciplinary nuclear laboratory, 6:26292
RADIOACTIVE MATERIALS
See also RADIOACTIVE WASTES

Packaging
Packaging configurations and handling requirements for nuclear materials, 6:26018 (CONF-810583—1)
Packaging Rules
Packaging configurations and handling requirements for nuclear materials, 6:26018 (CONF-810583—1)
RADIOACTIVE PARTICULATES
See PARTICLES
RADIOACTIVE WASTE DISPOSAL
Cost Benefit Analysis
Modeling and analyses to support EPA's low-level radioactive waste standards, 6:25107 (CONF-801217—)
Field Tests
Geologic disposal of radioactive waste: program plan for field testing, 6:25121 (DOE/NWTS—80-1)
Geologic Deposits
Geologic disposal of radioactive waste: program plan for field testing, 6:25121 (DOE/NWTS—80-1)
Nevada Nuclear Waste Storage Investigations. Radionuclide migration in tuff and granite: peer review documentation, 6:25128 (NVO—196-23)
Parametric and sensitivity analysis of waste isolation in a basalt medium, 6:25135 (RHO-BWI-C—94)
Site characterization plan basalt waste isolation project, 6:25136 (RHO-BWI-CD—51(Rev.2))
Health Hazards
Optimum model to predict radionuclide transport in an aquifer for the application to health effects evaluations, 6:25111 (CONF-801217—)
Overview of EPA's health risk assessment model for the shallow land disposal of LLW, 6:25167 (CONF-801217—)
High-Level Radioactive Wastes
Nevada Nuclear Waste Storage Investigations. Geologic and hydrologic investigation of Yucca Mountain: peer review documentation, 6:25127 (NVO—196-22)
Nevada Nuclear Waste Storage Investigations. Radionuclide migration in tuff and granite: peer review documentation, 6:25128 (NVO—196-23)
Nevada Nuclear Waste Storage Investigations: Quality Assurance Plan (Corrections to quality assurance plan), 6:25126 (NVO—196-17-Rev.1)
Low-Level Radioactive Wastes
Computer simulation of groundwater flow at a commercial radioactive-waste landfill near West Valley, Cattaraugus County, New York, 6:25116 (CONF-801217—)
Environmental analysis burial of offsite low-level waste at SRP, 6:25124 (DPST—80-466)
Fracture flow modeling for low-level nuclear waste disposal, 6:25114 (CONF-801217—)
Low-level radioactive waste modeling needs from the USNRC perspective, 6:25109 (CONF-801217—)
Modeling and low-level waste management: an interagency workshop, 6:25105 (CONF-801217—)
Modeling and analyses to support EPA's low-level radioactive waste standards, 6:25107 (CONF-801217—)
Modeling contaminant transport in porous media in relation to nuclear-waste disposal: a review, 6:25110 (CONF-801217—)
Modeling in low-level radioactive waste management from the US Geological Survey perspective, 6:25108 (CONF-801217—)
Models and criteria for LLW disposal performance, 6:25118 (CONF-801217—)
Overview of EPA's health risk assessment model for the shallow land disposal of LLW, 6:25167 (CONF-801217—)
USDOE needs in modeling for low-level radioactive waste management, 6:25106 (CONF-801217—)
Verification of partially saturated zone moisture migration: model and field facilities, 6:25113 (CONF-801217—)
Mathematical Models
Modeling and low-level waste management: an interagency workshop, 6:25105 (CONF-801217—)
Modeling and analyses to support EPA's low-level radioactive waste standards, 6:25107 (CONF-801217—)
Modeling in low-level radioactive waste management from the US Geological Survey perspective, 6:25108 (CONF-801217—)
Models and criteria for LLW disposal performance, 6:25118 (CONF-801217—)
USDOE needs in modeling for low-level radioactive waste management, 6:25106 (CONF-801217—)
Mill Tailings
Engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25122 (DOE/UMT—0103)
Summary of the engineering assessment of inactive uranium mill tailings, Durango Site, Durango, Colorado, 6:25123 (DOE/UMT—0103S)
Planning
Geologic disposal of radioactive waste: program plan for field testing, 6:25121 (DOE/NWTS—80-1)
Quality Assurance
Nevada Nuclear Waste Storage Investigations: Quality Assurance Plan (Corrections to quality assurance plan), 6:25126 (NVO—196-17-Rev.1)
Radiation Hazards
Systems model for evaluating population dose from low-level waste activities, 6:25168 (CONF-801217—)
Radiation Monitoring
Strontium-90 determinations by Cerenkov radiation counting for well monitoring at Oak Ridge National Laboratory, 6:25970 (ORNL/TM—7760)
Radionuclide Migration
Americium migration in basalt and implications to repository risk analysis, 6:25164 (CONF-8010130—8)
Assessment of effectiveness of geologic isolation systems: geostatistical modeling of pore velocity, 6:25165 (PNL—3789)
Regulations
Low-level radioactive waste modeling needs from the USNRC perspective, 6:25109 (CONF-801217—)
Risk Assessment
Optimum model to predict radionuclide transport in an aquifer for the application to health effects evaluations, 6:25111 (CONF-801217—)
Overview of EPA's health risk assessment model for the shallow land disposal of LLW, 6:25167 (CONF-801217—)
Parametric and sensitivity analysis of waste isolation in a basalt medium, 6:25135 (RHO-BWI-C—94)
Risk assessment and radioactive waste management, 6:25117 (CONF-801217—)
Site Selection
Nevada Nuclear Waste Storage Investigations. Geologic and hydrologic investigation of Yucca Mountain: peer review documentation, 6:25127 (NVO—196-22)
Site characterization plan basalt waste isolation project, 6:25136 (RHO-BWI-CD—51(Rev.2))
USDOE needs in modeling for low-level radioactive waste management, 6:25106 (CONF-801217—)
Standards
Modeling and analyses to support EPA's low-level radioactive waste standards, 6:25107 (CONF-801217—)
Models and criteria for LLW disposal performance, 6:25118 (CONF-801217—)
Underground Disposal
Computer simulation of groundwater flow at a commercial radioactive-waste landfill near West Valley, Cattaraugus County, New York, 6:25116 (CONF-801217—)
Geologic disposal of radioactive waste: program plan for field testing, 6:25121 (DOE/NWTS—80-1)
Low-level radioactive waste modeling needs from the USNRC perspective, 6:25109 (CONF-801217—)
Nevada Nuclear Waste Storage Investigations. Geologic and hydrologic investigation of Yucca Mountain: peer review documentation, 6:25127 (NVO—196-22)
Nevada Nuclear Waste Storage Investigations. Radionuclide migration in tuff and granite: peer review documentation, 6:25128 (NVO—196-23)
Overview of EPA's health risk assessment model for the shallow land disposal of LLW, 6:25167 (CONF-801217—)
Parametric and sensitivity analysis of waste isolation in a basalt medium, 6:25135 (RHO-BWI-C—94)
Site characterization plan basalt waste isolation project, 6:25136 (RHO-BWI-CD—51(Rev.2))

Verification of partially saturated zone moisture migration: model and field facilities, 6:25113 (CONF-801217—)

RADIOACTIVE WASTE FACILITIES

Design
Low-level radioactive waste modeling needs from the USNRC perspective, 6:25109 (CONF-801217—)

Environmental Impacts
Environmental analysis burial of offsite low-level waste at SRP, 6:25124 (DPST—80-466)

Evaluation
Low-level radioactive waste modeling needs from the USNRC perspective, 6:25109 (CONF-801217—)

Performance
Low-level radioactive waste modeling needs from the USNRC perspective, 6:25109 (CONF-801217—)

Public Relations
Public information plan for the Waste Isolation Pilot Plant Project, 6:25162 (WIPP-DOE—43)

Radiation Hazards
Environmental analysis burial of offsite low-level waste at SRP, 6:25124 (DPST—80-466)

Site Selection
Nuclear waste management and environmental mediation: an exploratory analysis. Topical report, 6:25131 (PNL—3678)
Risk comparison of centralizing or decentralizing processing facilities for defense transuranic waste, 6:25169 (RFP—3159)

Stress Analysis
MARC calculations for the second WIPP structural benchmark problem, 6:25143 (SAND—81-0925)

Underground Storage
Waste Isolation Pilot Plant. Project progress report for month ending April 30, 1981, 6:25159 (WIPP-DOE—87)

RADIOACTIVE WASTE MANAGEMENT

See also RADIOACTIVE WASTE STORAGE

Program report for FY 1980. Atmospheric and Geophysical Sciences Division of the Physics Department, 6:26161 (UCRL—51444-80)

High-Level Radioactive Wastes
Nuclear waste management. Quarterly progress report, January-March, 1981, 6:25130 (PNL—3000-9)

Mediation
Nuclear waste management and environmental mediation: an exploratory analysis. Topical report, 6:25131 (PNL—3678)

Meetings
Modeling and low-level waste management: an interagency workshop, 6:25105 (CONF-801217—)

Research Programs
Nuclear waste management. Quarterly progress report, January-March, 1981, 6:25130 (PNL—3000-9)

RADIOACTIVE WASTE PROCESSING

Alpha-Bearing Wastes
Risk comparison of centralizing or decentralizing processing facilities for defense transuranic waste, 6:25169 (RFP—3159)

Combustion
Process verification testing for burning TBP-containing organic solvents in the NWCF, 6:25125 (ENICO—1086)

High-Level Radioactive Wastes
Nuclear waste management. Quarterly progress report, January-March, 1981, 6:25130 (PNL—3000-9)

Iodine 129
Nuclear waste management. Quarterly progress report, January-March, 1981, 6:25130 (PNL—3000-9)

Krypton
Nuclear waste management. Quarterly progress report, January-March, 1981, 6:25130 (PNL—3000-9)

Mill Tailings
Asphalt emulsion sealing of uranium mill tailings. 1980 annual report, 6:25133 (PNL—3752)

Risk Assessment
Risk comparison of centralizing or decentralizing processing facilities for defense transuranic waste, 6:25169 (RFP—3159)

Solidification
Design and performance of a full-scale spray calciner for nonradioactive high-level-waste-vitrification studies, 6:25132 (PNL—3742)
Nuclear waste management. Quarterly progress report, January-March, 1981, 6:25130 (PNL—3000-9)

Transmutation
Disposal of nuclear wastes by transmutation, 6:25119 (CONF-810606—48)

RADIOACTIVE WASTE STORAGE

Research Programs
Technical progress report for the quarter January 1-March 31, 1980, 6:25129 (ONWI—9(2)(80))

Site Surveys
Some experiences from well testing in precambrian rocks of Sweden, 6:26405 (LBL—12076)

Tanks
Electrical and electronic subsystems of a nuclear waste tank annulus inspection system, 6:25141 (RHO-SA—221)
Long-term creep of Hanford concrete at 250°F and 350°F. Final report, 6:25138 (RHO-C—50)

Underground Storage
Correlations between pH and glass leaching, 6:25134 (PNL-SA—9102)
Engineered barrier development for a nuclear waste repository in basalt, 6:25137 (RHO-BWI-SA—64)
Waste Isolation Pilot Plant. Project progress report, November-December 1980, 6:25155 (WIPP-DOE—83)
Waste Isolation Pilot Plant. Project progress report, January 31, 1981, 6:25156 (WIPP-DOE—84)
Waste Isolation Pilot Plant. Project progress report, February 28, 1981, 6:25157 (WIPP-DOE—85)
Waste Isolation Pilot Plant. Project progress report, March 31, 1981, 6:25158 (WIPP-DOE—86)
Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending February 28, 1979, 6:25144 (WIPP-DOE—04)
Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending April 30, 1979, 6:25146 (WIPP-DOE—06)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending May 31, 1979, 6:25147 (WIPP-DOE—24)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending June 30, 1979, 6:25148 (WIPP-DOE—25)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending July 31, 1979, 6:25149 (WIPP-DOE—35)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending August 31, 1979, 6:25150 (WIPP-DOE—36)
Waste Isolation Pilot Plant (WIPP). Project progress report for month ending September 30, 1979, 6:25151 (WIPP-DOE—37)
Waste Isolation Pilot Plant. Project progress report for month ending August 31, 1980, 6:25152 (WIPP-DOE—74)
Waste Isolation Pilot Plant. Project progress report for month ending September 30, 1980, 6:25153 (WIPP-DOE—75)
Waste Isolation Pilot Plant. Project progress report for month ending October 31, 1980, 6:25154 (WIPP-DOE—76)

Volume
Tank-farm-waste-volume projections, 6:25139 (RHO-CD—80-615)

RADIOACTIVE WASTES

See also RADIOACTIVE EFFLUENTS

Information Systems
Computerized waste-accountability shipping and packaging system (WASP), 6:25102 (MLM—2842(OP))

Packaging
Computerized waste-accountability shipping and packaging system (WASP), 6:25102 (MLM—2842(OP))

Risk Assessment
Risk assessment and radioactive waste management, 6:25117 (CONF-801217—)

Transport
Computerized waste-accountability shipping and packaging system (WASP), 6:25102 (MLM—2842(OP))

RADIOCARBON DATING

See ISOTOPE DATING

RADIOCHEMICAL ANALYSIS

Quality Control
Experience with an analytical quality-control program, 6:25976

Standards
Spiked sample standards; their uses and disadvantages in analytical quality control, 6:26169

RADIOGRAPHS
See IMAGES
RADIOISOTOPE MIGRATION
See RADIONUCLIDE MIGRATION
RADIOISOTOPES
See also NEUTRON-RICH ISOTOPES
Radioecological Concentration
Animal Investigation Program: Nevada Test Site and Vicinity. Annual report, 1979, 6:26196 (DOE/DP/00539—042)
Selected radioisotopes in animal tissues in Nevada: ^{90}Sr and ^{137}Cs measurements from 1956 to 1977, 6:26195 (DOE/DP/00539—040)
RADIOMETERS
Calibration
Large-angular-scale anisotropy in the cosmic background radiation, 6:26433
RADIOMETRIC GAGES
Design
Design and use of density gauges for fossil-energy processes (Catalyst level detector), 6:24873 (SAND—81-1347C)
RADIONUCLIDE MIGRATION
(In environment.)
Bench-Scale Experiments
Groundwater-stream-simulation experiments for the evaluation of the safety of proposed nuclear waste repositories, 6:25120 (CONF-810722—1)
Forecasting
Fracture flow modeling for low-level nuclear waste disposal, 6:25114 (CONF-801217—)
Mathematical Models
Modeling contaminant transport in porous media in relation to nuclear-waste disposal: a review, 6:25110 (CONF-801217—)
Modeling in low-level radioactive waste management from the US Geological Survey perspective, 6:25108 (CONF-801217—)
Models and criteria for LLW disposal performance, 6:25118 (CONF-801217—)
Optimum model to predict radionuclide transport in an aquifer for the application to health effects evaluations, 6:25111 (CONF-801217—)
RADIONUCLIDES
See RADIOISOTOPES
RADIUM 226
Environmental Exposure Pathway
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
Radioecological Concentration
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
RADON
Health Hazards
Ionizing radiation levels in energy conserving structures, 6:26164 (CONF-800438—)
Measuring Methods
Ionizing radiation levels in energy conserving structures, 6:26164 (CONF-800438—)
Radiation Transport
Ionizing radiation levels in energy conserving structures, 6:26164 (CONF-800438—)
Radioecological Concentration
Ionizing radiation levels in energy conserving structures, 6:26164 (CONF-800438—)
RADON 199
Alpha Decay
Half-lives of ^{199}Rn and $^{199}Rn/sup\ m/$, 6:26593
RAILGUN ACCELERATORS
Pulse power applications of flux compression generators, 6:26635 (LA-UR—81-1601)
Operation
Railguns for equation-of-state research, 6:26026 (UCRL—85298)
Performance
Railguns for equation-of-state research, 6:26026 (UCRL—85298)
RAIN
See also ACID RAIN
Modifications
Power plant induced rainfall modification: Fact or fiction?, 6:26170
Simulation
Effects of simulated rain on the effluent from lysimeters with acid, shallow soil, rich in organic matter, 6:26139 (CONF-800365—)
RAIN WATER
Quantitative Chemical Analysis
Detection of acid compounds in the atmosphere by careful sampling and analysis of rainwater, 6:26134 (CONF-800365—)
RAMAN EFFECT
Mathematical Models
Critical analysis of theoretical models for the giant Raman effect from adsorbed molecules, 6:26473
Resonance
Critical analysis of theoretical models for the giant Raman effect from adsorbed molecules, 6:26473
RANKINE CYCLE ENGINES
Binary Rankine-cycle engines for solar-thermal power systems, 6:25309
Energy Recovery
Technical-economical aspects of mechanical energy production from waste heat by using organic fluids working on Rankine cycles, 6:25768 (CONF-800272—)
RARE EARTHS
See also CERIUM
DYSPROSIUM
ERBIUM
YTTERBIUM
Mass Transfer
Microcracks and energy. Progress report, April 1, 1980-February 28, 1981, 6:25089 (DOE/ER/04972—1)
RDF
See REFUSE DERIVED FUELS
REACTION KINETICS
Analysis of the chemistry associated with ozonolysis of organic pollutant molecules in water, 6:24942 (PB—81-115651)
REACTOR ACCIDENTS
See also FUEL ELEMENT FAILURE
LOSS OF COOLANT
LOSS OF FLOW
MELTDOWN
REACTOR CORE DISRUPTION
Safety considerations in the design and operation of light water nuclear power plants, 6:25541
Health Hazards
Investigations of reported plant and animal health effects in the Three Mile Island area. Regulatory report, 6:25533 (NUREG—0738)
Heat Transfer
Two-dimensional computational modeling of sodium boiling in simulated LMFBR fuel-pin bundles, 6:25521 (CONF-810606—54)
Hydraulics
Two-dimensional computational modeling of sodium boiling in simulated LMFBR fuel-pin bundles, 6:25521 (CONF-810606—54)
Mathematical Models
Differential sensitivity theory applied to movement of maxima responses (LMFBR), 6:25520 (CONF-810606—42)
Importance theory for lumped-parameter systems (LMFBR), 6:25526 (HEDL-SA—2329-FP)
Public Information
Shared responsibilities of the utility and the media in crisis situations, 6:25549
Risk Assessment
Measures of radiological consequences in nuclear-reactor-safety assessments, 6:25524 (DOE/SF/71032—T10)
REACTOR COMPONENTS
See also BREEDING BLANKETS
FUEL ELEMENTS
REACTOR CORES
Performance Testing
Qualification testing evaluation program light-water reactor safety research. Quarterly report Jul-Sep 79, 6:25534 (NUREG/CR—1492)

Thermal Insulation
New high-temperature guarded hot-box facility for reflective insulation, 6:25761
Ultrasonic Testing
Studies on Section XI ultrasonic repeatability, 6:25503 (EPRI-NP—1858)

REACTOR CONTROL THEORY
See REACTOR KINETICS

REACTOR CORE DISRUPTION
After-Heat Removal
Analysis of thermal conductivity probes for high temperature applications (LMFBR), 6:25537 (SAND—81-0106)
Test Facilities
Analysis of thermal conductivity probes for high temperature applications (LMFBR), 6:25537 (SAND—81-0106)

REACTOR CORES
Fuel Management
Assessment of the prevailing physics codes: LEOPARD, LASER, and EPRI-CELL, 6:25502 (HEDL-SA—2323)

REACTOR FUEL ELEMENTS
See FUEL ELEMENTS

REACTOR FUELS
See NUCLEAR FUELS

REACTOR INSTRUMENTATION
Research Programs
Instrumentation and Controls Division biennial progress report, September 1, 1978-September 1, 1980, 6:26081 (ORNL—5758)

REACTOR KINETICS
Antineutrinos
Reactor antineutrino spectra and their application to antineutrino-induced reactions II, 6:25501 (HEDL-SA—2303-FP)
Computer Calculations
Assessment of the prevailing physics codes: LEOPARD, LASER, and EPRI-CELL, 6:25502 (HEDL-SA—2323)
Electron Spectra
Reactor antineutrino spectra and their application to antineutrino-induced reactions II, 6:25501 (HEDL-SA—2303-FP)

REACTOR MAINTENANCE
Remote Handling Equipment
Nuclear reactor maintenance technology assessment. Final summary report, September 16, 1978-September 15, 1979, 6:25499 (DOE/OR/06102—T1)

REACTOR MATERIALS
(See also specific materials.)
See also NUCLEAR FUELS
Mechanical Properties
Progress in understanding the mechanical behavior of pressure-vessel materials at elevated temperatures, 6:25899 (CONF-810625—18)
Oxidation
Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region (PWR; BWR), 6:25522 (CONF-810801—3(Summ.))
Physical Radiation Effects
Response to annealing and reirradiation of AISI 304L stainless steel following initial high-dose neutron irradiation in EBR-II (LMFBR), 6:25488 (CONF-800609—17)
Sorptive Properties
Sorption of iodine on low-chromium-alloy steel (HTGR), 6:25484 (CONF-810606—52)
Standards
Steel plates for nuclear and other special applications (ASME SA-647 with additional requirements), 6:25498 (NE-M—5-23T(4/81)(Rev.))
Thermal Conductivity
Analysis of thermal conductivity probes for high temperature applications (LMFBR), 6:25537 (SAND—81-0106)

REACTOR PROTECTION SYSTEMS
Safety considerations in the design and operation of light water nuclear power plants, 6:25541

REACTOR SAFETY
(Theoretical and experimental investigations of the behavior of reactor types and designs under various real or hypothetical accidents.)
Public Information
Press and nuclear energy, 6:25546
Research Programs
Light water reactor safety research program. Quarterly report Jan-Mar 80, 6:25535 (NUREG/CR—1509)

REACTOR VESSELS
Creep
Assessment of long-term structural behavior of an asymmetric multi-cavity PCRV (900 MW(e)), 6:25486 (GA-A—16269)

RECEIVERS (SOLAR)
See SOLAR RECEIVERS

RECOMBINERS
Performance
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells. Final report (Hydrogen-oxygen gas recombination device), 6:25583 (ANL/OEPM—80-8)

RECTISOL PROCESS
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))

RECYCLE (FUEL)
See FUEL CYCLE

RECYCLING
By-Products
Enhanced utilization of used lubricating oil recycling process by-products, 6:25044 (DOE/BETC/IC—80/3(Vol.4))
Meetings
ELMIA-AVFALL 79 (Combined heat-power production; composting; research and practices; waste recovery; hazardous waste), 6:25835 (CONF-7909198—)
Waste Product Utilization
Enhanced utilization of used lubricating oil recycling process by-products, 6:25044 (DOE/BETC/IC—80/3(Vol.4))

REDOX FUEL CELLS
Cost
Cost projections for redox energy-storage systems. Final report, April 30, 1979-September 30, 1979, 6:25666 (DOE/NASA/0126—1)
Design
Cost projections for redox energy-storage systems. Final report, April 30, 1979-September 30, 1979, 6:25666 (DOE/NASA/0126—1)
Performance
NASA preprototype redox storage system for a photovoltaic stand-alone application, 6:25669 (DOE/NASA/12726—8)

REFINER-MARKETERS
See MARKETERS

REFRACTORIES
Performance Testing
Heat transfer in refractory fiber insulations, 6:25760
Thermal Conductivity
Determination of the thermal conductivity of refractory insulating materials by the hot-wire method (Temperatures to 1000°C), 6:25686
Heat transfer in refractory fiber insulations, 6:25760
Thermal conductivity of refractories: working with the hot-wire method, 6:25685

REFRIGERATORS
See also MAGNETIC REFRIGERATORS
Directories
Energy-efficiency directory of refrigerators and refrigerator-freezers, 6:25719 (DOE/CS/20315—T11)
Operating Cost
Energy-efficiency directory of refrigerators and refrigerator-freezers, 6:25719 (DOE/CS/20315—T11)
Specifications
Energy-efficiency directory of refrigerators and refrigerator-freezers, 6:25719 (DOE/CS/20315—T11)

REFUSE
See SOLID WASTES

REFUSE DERIVED FUELS
See also INDUSTRIAL WASTES
MUNICIPAL WASTES
SOLID WASTES
SYNTHETIC FUELS
Refuse-derived fuels, 6:25844

Calorific Value
Overview of prepared fuels technology, 6:25201 (ANL/CNSV-TM—60)
Combustion
Considerations affecting dedicated boiler design for refuse-derived fuels (RDF), 6:26059 (ANL/CNSV-TM—60)
Waste fuel densification: review of the technology and applications, 6:25202 (ANL/CNSV-TM—60)
Combustion Properties
Advantages of the hydrasposal process as applied to the Hempstead Resources Recovery Plant and the Dade County Solid Waste Recovery Plant, 6:25830 (ANL/CNSV-TM—60)
Energy Demand
Biomass densification energy requirements, 6:25206
Market
Americology Resource Recovery System, 6:25203 (ANL/CNSV-TM—60)
Marketing
Technical and marketing issues affecting the use of RDF as kiln fuel, 6:25204 (ANL/CNSV-TM—60)
Meetings
Proceedings of the international conference on prepared fuels and resource recovery technology, 6:25199 (ANL/CNSV-TM—60)
Production
Advantages of the hydrasposal process as applied to the Hempstead Resources Recovery Plant and the Dade County Solid Waste Recovery Plant, 6:25830 (ANL/CNSV-TM—60)
Americology Resource Recovery System, 6:25203 (ANL/CNSV-TM—60)
ECO-FUEL/sup R/II: the third generation, 6:25827 (ANL/CNSV-TM—60)
New generation - the Flakt recovery system, 6:25831 (ANL/CNSV-TM—60)
Overview of prepared fuels technology, 6:25201 (ANL/CNSV-TM—60)
Raytheon Service Company experience and programs in resource recovery, 6:26057 (ANL/CNSV-TM—60)
Shredding for prepared fuel systems, 6:26054 (ANL/CNSV-TM—60)
Waste fuel densification: review of the technology and applications, 6:25202 (ANL/CNSV-TM—60)
Research Programs
Obtaining improved products from the organic fraction of municipal solid waste. Final report, 6:25843 (PB—81-110918)
Technology Assessment
Prepared fuel systems: selecting an option, 6:25200 (ANL/CNSV-TM—60)
Uses
Issues for refuse derived fuels as applied to utility boilers, 6:25437 (ANL/CNSV-TM—60)
Technical and marketing issues affecting the use of RDF as kiln fuel, 6:25204 (ANL/CNSV-TM—60)

REFUSE-FUELED BOILERS
Design
Considerations affecting dedicated boiler design for refuse-derived fuels (RDF), 6:26059 (ANL/CNSV-TM—60)
Efficiency
Waste fuel densification: review of the technology and applications, 6:25202 (ANL/CNSV-TM—60)
Manufacturers
Economical and reliable disposal and solid waste by Combustion Engineering, Inc, the domestic supplier of energy systems worldwide, 6:26058 (ANL/CNSV-TM—60)

REFUSE-FUELED POWER PLANTS
Economics
Issues for refuse derived fuels as applied to utility boilers, 6:25437 (ANL/CNSV-TM—60)

REGENERATORS
See also SOLAR REGENERATORS
Materials
Ceramic regenerator systems development program. Final report, 6:25862 (DOE/NASA/0008—12)
Performance Testing
Ceramic regenerator systems development program. Final report, 6:25862 (DOE/NASA/0008—12)

REGION I
See NORTH ATLANTIC REGION

REGION II
See MID-ATLANTIC REGION

REGION VI
See SOUTHWEST REGION

REGULATIONS
See also PACKAGING RULES
POLLUTION REGULATIONS
Government Policies
Program standard for assuring that today's management obligations in environmental, safety, and health areas are met, 6:25607 (SAND—81-1359C)

REINDEER
See DEER

RELIEF VALVES
Performance Testing
Status of prototype rupture disc testing in the large leak test rig, 6:25492 (DOE/SF/70030—T18)

REMOTE HANDLING EQUIPMENT
Technology Assessment
Nuclear reactor maintenance technology assessment. Final summary report, September 16, 1978-September 15, 1979, 6:25499 (DOE/OR/06102—T1)

RESEARCH AND TEST REACTORS
Fuel Plates
Irradiation testing of miniature fuel plates for the RERTR program (Reduced Enrichment Research and Test Reactors), 6:25515 (ORNL/TM—7761)

RESEARCH PROGRAMS
Management
Development of an operational framework for the Liquid Fossil Fuel Cycle (LFFC), 6:26717 (DOE/BETC/IC—80/3(Vol.4))

RESERVOIR ROCK
See also FRACTURED RESERVOIRS
Fluid Flow
Use of similarity methods in evaluation of reservoir simulators, 6:24989 (DOE/BETC/IC—80/3(Vol.1))
Ion Exchange
Relation between the cation exchange capacity, clay content and surface area in western reservoir rock, 6:24997 (DOE/BETC/IC—80/3(Vol.1))
Permeability
Relationship of permeability to confining pressure in low permeability rock, 6:24999 (DOE/BETC/IC—80/3(Vol.1))
Rock-Fluid Interactions
Adsorption from flooding solutions in porous media: a study of interactions of surfactants and polymers with reservoir minerals, 6:25013 (DOE/BETC/IC—80/3(Vol.2))
Simulators
Use of similarity methods in evaluation of reservoir simulators, 6:24989 (DOE/BETC/IC—80/3(Vol.1))

RESERVOIRS (WATER)
See WATER RESERVOIRS

RESIDENTIAL BUILDINGS
See also APARTMENT BUILDINGS
HOUSES
Demonstration Programs
New energy-conserving passive solar single-family homes. Cycle 5, Category 2 HUD solar heating and cooling demonstration program, 6:25346 (HUD-PDR—664)
Energy Conservation
Overview of the Committee-proposed residential building standards, 6:25731
Energy Consumption
Energy performance characteristics of selected earth sheltered residences, 6:25696 (CONF-800438—)
Energy Efficiency Standards
Energy performance characteristics of selected earth sheltered residences, 6:25696 (CONF-800438—)
The impact of residential energy conservation standards on credit markets, 6:25723 (PB—81-106940)

Passive Solar Cooling Systems
New energy-conserving passive solar single-family homes. Cycle 5, Category 2 HUD solar heating and cooling demonstration program, 6:25346 (HUD-PDR—664)
Passive Solar Heating Systems
New energy-conserving passive solar single-family homes. Cycle 5, Category 2 HUD solar heating and cooling demonstration program, 6:25346 (HUD-PDR—664)
Site Selection
Integrating site locational criteria for underground housing, 6:25698 (CONF-800438—)
Solar Water Heaters
New energy-conserving passive solar single-family homes. Cycle 5, Category 2 HUD solar heating and cooling demonstration program, 6:25346 (HUD-PDR—664)
Space Heating
Energy: comparative energy consumption of space and water heating appliances, 6:25730
Standards
Overview of the Committee-proposed residential building standards, 6:25731
Thermal Efficiency
Tests for thermal efficiency of dwellings. Final report, 6:25722 (PB—81-105736)

RESIDENTIAL SECTOR
Power Demand
Socioeconomic impacts of time-of-day pricing by electric utilities: a case study of Philadelphia residential customers, 6:25637 (BNL—51326)

RESIDUAL FUELS
Chemical Composition
Geochemical characterization of petroleum using carbon, sulfur, hydrogen and nitrogen stable isotopes, 6:25055 (DOE/BETC/IC—80/3(Vol.4))
Fuel Additives
Use of fuel additives in oil firing, 6:25061 (EPRI-WS—80-127)

RESIDUAL OILS
See PETROLEUM RESIDUES

RESIDUAL PETROLEUM
Data Base Management
Improved computer-based system for managing information on enhanced oil recovery (EOR) and residual oil saturation (ROS), 6:24988 (DOE/BETC/IC—80/3(Vol.1))
Measuring Methods
Reservoir evaluation and measurement of oil saturation, 6:24979 (DOE/BETC/IC—80/3(Vol.1))
Residual oil saturation determination Wilmington micellar-polymer project, October, 1979-October, 1980, 6:24981 (DOE/BETC/IC—80/3(Vol.1))
Single-well chemical tracer method for measuring residual oil saturation, 6:24992 (DOE/BETC/IC—80/3(Vol.1))
Waterflood residual oil saturation technology test in a semi-consolidated sandstone reservoir, 6:24982 (DOE/BETC/IC—80/3(Vol.1))
Mobility
Entrapment and mobilization of residual oil, 6:24986 (DOE/BETC/IC—80/3(Vol.1))

RESIDUES (RADIOACTIVE)
See RADIOACTIVE WASTES

RESOURCE ASSESSMENT
Resource assessment. Annual report, October 1, 1979-September 30, 1980, 6:24975 (DOE/BETC/IC—80/3(Vol.1))

RESOURCE RECOVERY ACTS
Compliance
Evaluation of potential impacts to the utility sector for compliance with RCRA, 6:25840 (EPA/600/9—81-019B)

RESOURCE RECOVERY FACILITIES
Construction
Implementation of a resource recovery program: full service approach, 6:25824 (ANL/CNSV-TM—60)
Equipment
Reducing explosion damage in primary and secondary refuse shredders, 6:25826 (ANL/CNSV-TM—60)
Evaluation
RDF fuels in a waste-to-energy system -- the Teledyne National experience, 6:25829 (ANL/CNSV-TM—60)
Financing
Development and implementation of prepared solid waste fuels to energy projects through the architectural/engineering approach, 6:25825 (ANL/CNSV-TM—60)
International conference on prepared fuels and resource recovery, 6:26300 (ANL/CNSV-TM—60)
Private sector viewpoint of waste flow control for the DOE/EPA conference on prepared fuels and resource recovery technology, 6:25832 (ANL/CNSV-TM—60)
Waste flow control and its role in financing resource recovery facilities, 6:26301 (ANL/CNSV-TM—60)
Implementation
Role of the consulting engineer in the implementation of resource recovery systems, 6:25828 (ANL/CNSV-TM—60)
Institutional Factors
Waste flow control - the public perspective, 6:25833 (ANL/CNSV-TM—60)
Investment
International conference on prepared fuels and resource recovery, 6:26300 (ANL/CNSV-TM—60)
Legal Aspects
Legal and practical aspects of controlling the waste flow: a case study from Delaware County, Pennsylvania, 6:25630 (ANL/CNSV-TM—60)
Meetings
Proceedings of the international conference on prepared fuels and resource recovery technology, 6:25199 (ANL/CNSV-TM—60)
Operation
ECO-FUEL/sup R/II: the third generation, 6:25827 (ANL/CNSV-TM—60)
Private sector viewpoint of waste flow control for the DOE/EPA conference on prepared fuels and resource recovery technology, 6:25832 (ANL/CNSV-TM—60)
Planning
Implementation of a resource recovery program: full service approach, 6:25824 (ANL/CNSV-TM—60)
Refuse-derived fuels, 6:25844
Pollution Control
Legal and practical aspects of controlling the waste flow: a case study from Delaware County, Pennsylvania, 6:25630 (ANL/CNSV-TM—60)
Safety
Reducing explosion damage in primary and secondary refuse shredders, 6:25826 (ANL/CNSV-TM—60)

RESPIRATION
Pathological Changes
Physiological responses to acid water in fish. 2. Effects of acid water on metabolism and gill ventilation in brown trout, Salmo trutta L., and brook trout, Salvelinus fontinalis Mitchill, 6:26384 (CONF-800365—)

RETAIL BUYERS
See RETAILERS

RETAIL SELLERS
See RETAILERS

RETAILERS
Attitudes
Project Monitor: Part II. Conservation in small business: an exploratory study. Final report, 6:25718 (DOE/CS/10220—T1)
Energy Conservation
Project Monitor: Part II. Conservation in small business: an exploratory study. Final report, 6:25718 (DOE/CS/10220—T1)

REVERSE-FIELD PINCH
Plasma Diagnostics
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear, 6:26634 (LA—8828-MS)

REVERSIBLE TURBINES
See PUMP TURBINES

RHENIUM
Chemical Vapor Deposition
Rhenium muffle tube fabricated by CVD for application in 1800°C high thermal efficiency fuel processing furnace, 6:25904 (HEDL-SA—2137)

W-Re composite tube fabricated by chemical vapor deposition for application in an 1800°C high thermal efficiency fuel-processing furnace, 6:25908

RHENIUM OXIDES
Spectroscopy
High-resolution spectroscopy of matrix-isolated ReO_4^- molecules, 6:25929

RHO-765 RESONANCES
Particle Widths
Radiative widths of K and rho mesons, 6:26509
Radiative Decay
Radiative widths of K and rho mesons, 6:26509

RHODAMINES
Laser Spectroscopy
Picosecond spectroscopy of polar dye solutions at antistokes excitation, 6:25995 (UCRL-Trans—11679)

RHODANATES
See THIOCYANATES

RHODANIDES
See THIOCYANATES

RHODE ISLAND
Wind Power
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)

RHYOLITES
Activation Analysis
Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)

RICCATI EQUATION
Nonlinear Problems
Universal formats for nonlinear ordinary differential systems, 6:26730

RICHLAND FFTF REACTOR
See FFTF REACTOR

RIEMANN WAVES
See SHOCK WAVES

RISER CRACKING
See COAL LIQUEFACTION

RIVERS
See also STREAMS
Acidification
Aluminum, a buffer in acidic waters, 6:26253 (CONF-800365—)
Evidence of acidification of rivers of Eastern Canada, 6:26262 (CONF-800365—)
River Hoegvadsan liming project: a presentation, 6:26365 (CONF-800365—)
Some aspects of acidification in southern Ontario, 6:26249 (CONF-800365—)
Baseline Ecology
Tongue River in Wyoming: a baseline fisheries assessment, Monarch to the state line, 6:26297 (ANL/LRP—10)
Water Chemistry
Chemical characteristics and buffer capacity of fifty alpine lakes (Italy, Pennine-Lepontine Alps), 6:26259 (CONF-800365—)
Streamwater chemistry before, during and after snowmelt, 6:26254 (CONF-800365—)

RIVETS
See FASTENERS

ROADS
Air Pollution
Analytical and experimental assessment of highway impact on air quality: data analysis and model evaluation. Research report (final) Sep 74-21 Jan 80, 6:26159 (PB—81-114738)
Thermal Insulation
Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations, 6:25687

ROCK BEDS
Mathematical Models
Series-parallel solar-augmented rock-bed heat pump. Convolution model of rock bed, 6:25390 (DOE/CS/34697—T1)
Sensible Heat Storage
Series-parallel solar-augmented rock-bed heat pump. Convolution model of rock bed, 6:25390 (DOE/CS/34697—T1)

ROCK CAVERNS
Compressed Air Energy Storage
Compressed air energy storage technology program. Annual report for 1980, 6:25573 (PNL—3804)
Mathematical Models
Water coning in porous media reservoirs for compressed air energy storage, 6:25572 (PNL—3470)
Porosity
Water coning in porous media reservoirs for compressed air energy storage, 6:25572 (PNL—3470)
Stability
Compressed air energy storage technology program. Annual report for 1980, 6:25573 (PNL—3804)

ROCK-FLUID INTERACTIONS
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))
Mathematical Models
Interpretation of a hydraulic fracturing experiment, Monticello, South Carolina, 6:26431

ROCKS
See also IGNEOUS ROCKS
RESERVOIR ROCK
SEDIMENTARY ROCKS
Capillaries
Capillary effects in rocks of the earth: influence on well behavior, 6:26428 (LBL—12076)
Hydrology
Some experiences from well testing in precambrian rocks of Sweden, 6:26405 (LBL—12076)
Permeability
Analysis of constant-head well tests in nonporous fractured rock, 6:26410 (LBL—12076)
In situ premeability measurements for an underground compressed air storage project, 6:26407 (LBL—12076)
Instrumentation for determining rock mass permeability by hydro-pneumatic pressure testing, 6:26415 (LBL—12076)
Time-dependent transmissivity of joints. Progress report, July 1, 1980-June 30, 1981, 6:26425 (DOE/ER/04054—5)
Weathering
Effect of chemical weathering on surface waters, 6:26276 (CONF-800365—)

ROOFS
Design
Thin shell roof systems and construction techniques for earth sheltered housing, 6:25746
Heat Losses
Simple method for determining heat flow through earth covered roofs, 6:25737
Thermal Insulation
Heat transfer versus pitch angle for nonventilated, triangular-sectioned, apex-upward air-filled space, 6:25751
Laboratory and field investigations of moisture absorption and its effect on thermal performance of various insulations, 6:25687

ROTARY DRILLS
See also DRILL BITS
WELL DRILLING
On-Line Control Systems
ADVCON APT postprocessor, 6:26016 (BDX—613-2635)

ROTORS
See also DARRIEUS ROTORS
TIPVANE ROTORS
Friction
The response of turbine engine rotors to interference rubs, 6:25855 (AD—A-090408)

RUBBERS
See also LATEX
Activation Analysis
Simultaneous determination of antimony and chlorine in synthetic rubbers by 14-MeV neutron-activation analysis, 6:25971 (SAND—81-0156C)

RUBIDIUM
Ion Collisions
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)
RUNOFF
Ionic Composition
Input-output budgets of major ions at gauged catchments in Norway, 6:26265 (CONF-800365—)
Observed relationships between ionic composition of precipitation and runoff, 6:26261 (CONF-800365—)
Quantitative Chemical Analysis
Properties of acidified waters, 6:26117 (CONF-800365—)
RUPTURE DISKS
See RELIEF VALVES
RUTHENIUM
Catalytic Effects
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)

S

SALINITY GRADIENT POWER PLANTS
Environmental Impacts
Ocean energy technologies: an environmental overview, 6:25321
Technology Assessment
Ocean energy technologies: an environmental overview, 6:25321
SALMON
Reproduction
Effects of low pH on hatching of Atlantic salmon eggs, 6:26377 (CONF-800365—)
SALT DEPOSITS
Deformation
Elastic-plastic mechanical constitutive description for rock salt triaxial compression, 6:25142 (SAND—80-1935)
Thermal Conductivity
Thermal conductivity of polyhalite and anhydrite from the site of the proposed waste isolation pilot plant, 6:26430 (SAND—81-0856)
SALTS
Diffusion
Evaluation of mathematical models for characterizing plume behavior from cooling towers. Volume 2. Salt drift deposition from natural draft cooling towers. Technical report, 6:25460 (NUREG/CR—1581-V-2)
Waste Disposal
Disposal of soluble salt waste from coal gasification, 6:24923 (AD—A-090419)
SAMARIUM NITRIDES
Form Factors
Magnetic properties of SmN, 6:25947
Magnetic Properties
Magnetic properties of SmN, 6:25947
Neutron Diffraction
Magnetic properties of SmN, 6:25947
SAN FRANCISCO BAY
Air Pollution
Application of photochemical models. Volume III. Recent sensitivity tests and other applications of the LIRAQ model. Final report, 6:26154 (PB—81-112898)
SANDSTONES
Fluid Flow
Experimental evaluation of reservoir pretreatment in chemical flooding, 6:25015 (DOE/BETC/IC—80/3(Vol.2))
Relative permeability of low tension systems at elevated temperatures, 6:25026 (DOE/BETC/IC—80/3(Vol.2))
Fractures
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Permeability
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Relative permeability of low tension systems at elevated temperatures, 6:25026 (DOE/BETC/IC—80/3(Vol.2))
Porosity
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Rock-Fluid Interactions
Adsorption from flooding solutions in porous media: a study of interactions of surfactants and polymers with reservoir minerals, 6:25013 (DOE/BETC/IC—80/3(Vol.2))
SANITARY LANDFILLS
Energy Recovery
Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, Glendale, California. Final report, 6:25838 (DOE/CE/20237—1)
Gas Yields
Main research topics in the Department of Waste Management of the University of Stuttgart and a report on current investigations of practical interest concerning landfill gas, 6:25180 (CONF-7909198—)
Methane
Feasibility study: utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamas County, Oregon, 6:25892 (DOE/RA/50366—T1)
SATELLITE POWER SYSTEM
See ORBITAL SOLAR POWER PLANTS
SATELLITE SOLAR POWER STATIONS
See ORBITAL SOLAR POWER PLANTS
SAVANNAH RIVER PLANT
Molluscs
Freshwater bivalve mollusca (unionidae, sphaeriidae, corbiculidae) of the Savannah River Plant, South Carolina, 6:26211 (SRO-NERP—3)
SCANDIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
SCANDIUM ALLOYS
Magnetic Properties
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
Superconductivity
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
SCANDIUM COMPOUNDS
Thermal Diffusivity
Method for fast pulsed thermal diffusivity measurements in thin films, 6:26614 (SAND—80-2694C)
SCHOOL BUILDINGS
Design
Design innovations for a new minerals engineering building, 6:25740
Solar Architecture
Integrated architectural and mechanical design for the Arizona State University energy efficient house and laboratory, 6:25733
Solar Space Heating
Solar heating and hot water system installed at Alderson Broaddus College, Philippi, West Virginia, 6:25341 (DOE/NASA/CR—161756)
Solar space- and water-heating system at Stanford University. Final report, 6:25334 (DOE/CS/31522—T2)
Solar Water Heating
Solar heating and hot water system installed at Alderson Broaddus College, Philippi, West Virginia, 6:25341 (DOE/NASA/CR—161756)
Solar space- and water-heating system at Stanford University. Final report, 6:25334 (DOE/CS/31522—T2)
SCHOOL FACILITIES
See EDUCATIONAL FACILITIES
SCHOOL PLANT
See EDUCATIONAL FACILITIES

SCHOTTKY BARRIER DIODES
Electrical Properties
Controlled cadmium telluride thin films for solar-cell applications. Third quarterly report, December 1, 1980-February 1, 1981, 6:25260 (SERI/PR—9131-1-T3)
SCINTILLATOR-PHOTODIODE DETECTORS
Semiconductor Materials
Radiation-to-light converters for nuclear environments: near-infrared emitters, 6:26083 (UCRL—85604)
SCREENS
Electric Conductivity
Spectral selectivity of conducting micromeshes, 6:25388
SCREWS
See FASTENERS
SCRUBBERS
Design
Evaluation of 10-MW Shawnee cocurrent scrubber. Final report, 6:25453 (EPRI-CS—1806)
Economics
Cyclic reheat for FGD: status report. Final report, 6:25454 (EPRI-CS—1843)
Proceedings: symposium on flue-gas desulfurization, 6:24926 (EPA/600/9—81-019B)
Efficiency
Evaluation of 10-MW Shawnee cocurrent scrubber. Final report, 6:25453 (EPRI-CS—1806)
Evaluation
Evaluation of 10-MW Shawnee cocurrent scrubber. Final report, 6:25453 (EPRI-CS—1806)
Flowsheets
Proceedings: symposium on flue-gas desulfurization, 6:24926 (EPA/600/9—81-019B)
Sludges
Potential effects on groundwater of fly ash and FGD waste disposal in lignite surface mine pits in North Dakota, 6:24927 (EPA/600/9—81-019B)
SEAFOOD
Solar Drying
Solar drying of seafood products, 6:25359
SEALING MATERIALS
Materials Testing
Asphalt emulsion sealing of uranium mill tailings. 1980 annual report, 6:25133 (PNL—3752)
SEAS
Aquatic Ecosystems
Applying results derived from experimental microcosms to the study of natural pelagic marine ecosystems, 6:26241
Mathematical Models
Two-dimensional modeling of the oceans and CO_2 uptake, 6:26289 (UCRL—85673)
Microcosms
Marine microcosms in ecological research, 6:26240
Uptake
Two-dimensional modeling of the oceans and CO_2 uptake, 6:26289 (UCRL—85673)
Water Pollution
Report to the Congress on ocean pollution and offshore development, October 1977 through September 1978. Annual report No. 6, 6:26298 (PB—81-118333)
SEAWATER
Degassing
OTEC gas-desorption studies, 6:25314 (CONF-810622—2)
SEAWEEDS
Aquaculture
Biomass production by freshwater and marine macrophytes, 6:25283
SEBACEOUS GLANDS
See SKIN
SEDIMENTARY ROCKS
See also LIMESTONE
SANDSTONES
Fractures
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Permeability
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Porosity
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
SEDIMENTS
Activation Analysis
Neutron-activation analysis of several US Geological Survey and National Bureau of Standards reference materials, 6:25967 (DOE/EV/10403—3)
Chemical Composition
Relative mobilization of zinc, cerium, and americium from sediment in an aquatic microcosm, 6:26293
Chemical Oxygen Demand
Heavy-metal and nutrients effects on sediment oxygen demand in three-phase aquatic microcosms, 6:26224
Decomposition
Decomposition and exchange processes in acidified lake sediment, 6:26279 (CONF-800365—)
Isotope Dating
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. I. Sediment dating and chemical stratigraphy, 6:26271 (CONF-800365—)
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. III. Cladoceran community structure and stratigraphy, 6:26273 (CONF-800365—)
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. IV. Synthesis, and comparison with New England, 6:26274 (CONF-800365—)
Radionuclide Migration
Metal tracers in two marine microcosms: sensitivity to scale and configuration, 6:26290
Radionuclides in liquid effluents from Argonne National Laboratory: an example of monitoring for a multidisciplinary nuclear laboratory, 6:26292
Relative mobilization of zinc, cerium, and americium from sediment in an aquatic microcosm, 6:26293
Transport
State-of-the-art in modeling solute and sediment transport in rivers, 6:26286 (CONF-801217—)
SEISMIC ARRAYS
Classification
Geotechnical data from accelerograph stations investigated during the period 1975-1979. Summary report, 6:26419 (NUREG/CR—1643)
Site Surveys
Geotechnical data from accelerograph stations investigated during the period 1975-1979. Summary report, 6:26419 (NUREG/CR—1643)
SEISMIC EFFECTS
Ground Motion
Ground rupture and seismic shaking as separate hazards of active faults (a study of active faulting in the Ojai Valley, Southern California), 6:26423
SEISMIC EVENTS
See also EARTHQUAKES
EXPLOSIONS
NUCLEAR EXPLOSIONS
Hazards
Volcanic and seismic hazards on the eastern Snake River Plain, Idaho, 6:26422
SELENIDES
Thermoelectric Properties
Progress report No. 29 for a program of thermoelectric generator testing and RTG degradation mechanisms evaluation, 6:25657 (DOE/ET/33003—T2)
SELENIUM 78 TARGET
Neon 20 Reactions
Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near N ~ 50, 6:26587
SELENIUM 82 TARGET
Argon 40 Reactions
Observation of giant dipole resonances built on states of high energy and spin, 6:26588
SELENIUM COMPOUNDS
Shubnikov-De Haas Effect
Magnetic quantum oscillations in tetramethyltetraselenafulvalene-hexafluorophosphate [$(TMTSF)_2PF_6$], 6:25959

SELLERS
See MARKETERS
SEMICONDUCTOR DETECTORS
See also GE SEMICONDUCTOR DETECTORS
SI SEMICONDUCTOR DETECTORS
Performance
Status and problems of semiconductor detectors, 6:26079 (LBL—12380)
Specifications
Status and problems of semiconductor detectors, 6:26079 (LBL—12380)
SEMICONDUCTOR MATERIALS
(See also specific semiconductor materials.)
Emission Spectra
Radiation-to-light converters for nuclear environments: near-infrared emitters, 6:26083 (UCRL—85604)
SENIOR CENTERS
See PUBLIC BUILDINGS
SEPARATION PROCESSES
Energy Conservation
Air separation by the Moltox process. Interim final report, 6:25797 (DOE/CS/40287—T1)
SEWAGE
See LIQUID WASTES
SEWAGE SLUDGE
Anaerobic Digestion
Refuse conversion to methane (RefCOM): a proof-of-concept anaerobic digestion facility, 6:25187
Biodegradation
Use of microcosms in studying decomposition processes in sewage sludge, 6:26231
Fluidized-Bed Combustion
Energy recovery from municipal solid waste and sewage sludge using multisolid fluidized-bed combustion technology, 6:25205
SEWAGE TREATMENT
See WASTE PROCESSING
SHALE OIL
Combustion Products
Gas turbine combustor performance on synthetic fuels, 6:25440 (EPRI-AP—1623-Vol.2)
Research Programs
Distillate shale oil/diesel engine operating compatibility, 6:25795 (DOE/BETC/IC—80/3(Vol.4))
Stability
Fundamental synthetic fuel stability study, 6:24901 (DOE/BETC/IC—80/3(Vol.4))
Processing and stability characteristics of liquids from coal, shale, and heavy oils, 6:24900 (DOE/BETC/IC—80/3(Vol.4))
Stability characteristics of hydrocarbon fuels from alternative sources, 6:24902 (DOE/BETC/IC—80/3(Vol.4))
Storage
Fundamental synthetic fuel stability study, 6:24901 (DOE/BETC/IC—80/3(Vol.4))
SHALES
See also OIL SHALES
Fractures
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Hydrology
Measurement of in-situ hydraulic conductivity in the Cretaceous Pierre Shale, 6:26412 (LBL—12076)
Permeability
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
Porosity
Fracture flow of groundwater in coal-bearing strata, 6:24898 (CONF-801263—1)
SHEAR
Fluctuations
Some aspects of fluctuating vertical wind shears, 6:25424 (PNL—3771)
SHELLS (CONTAINMENT)
See CONTAINMENT SHELLS
SHIELDING
Design
First-wall, blanket, and shield engineering test program for magnetically confined fusion power reactors, 6:26684 (CONF-801011—100)
Importance of shield design in minimizing radioactive-material inventory in tokamaks, 6:26670 (CONF-801011—85)
Neutron Transport
Analysis of the ORNL radiation-streaming integral experiments, 6:26629 (CONF-810606—40)
SHIPPINGPORT REACTOR
Reactor Operation
[Shippingport Atomic Power Station]. Quarterly operating report, first quarter 1981, 6:25483 (DLCS—5000181)
SHIPS
See also SUBMARINES
Air Pollution
Inventory of emissions from boating sources in California. Final report, 6:26152 (PB—81-111460)
SHOCK WAVES
Electrical-to-chemical connection, 6:25992 (SAND—81-1350C)
Shock-induced inorganic chemistry, 6:25985 (SAND—81-1455C)
Ultrahigh-Speed Photography
Psuedo-3D, isodensity and density profiles from fiber optic output of a MACH-130 air shock, 6:26091 (UCRL—85655)
SI SEMICONDUCTOR DETECTORS
Fabrication
Design and fabrication of a high-damage threshold infrared Smattt interferometer, 6:26696 (LA-UR—81-1395)
SILANES
Chemical Reactions
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines. Progress report, August 16, 1980-April 30, 1981, 6:25996 (DOE/ER/03416—21)
Decomposition
Low-cost-silicon-process development. Phase IV: process improvement. Second quarterly technical progress report, 6:25259 (SERI/PR—8279-1-T2)
Glow Discharges
Diagnostics of a glow discharge used to produce hydrogenated amorphous silicon films. Final report, February 15, 1980-April 14, 1981, 6:25264 (SERI/TR—9053-1-T3)
Photolysis
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines. Progress report, August 16, 1980-April 30, 1981, 6:25996 (DOE/ER/03416—21)
Synthesis
Low-cost-silicon-process development. Phase IV: process improvement. Second quarterly technical progress report, 6:25259 (SERI/PR—8279-1-T2)
SILICA
Catalytic Effects
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Mechanism and kinetics of Fischer-Tropsch synthesis over supported ruthenium catalysts, 6:24868 (LBL—12278)
Comparative Evaluations
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
Precipitation
Method for inhibiting silica precipitation and scaling in geothermal flow systems (Patent), 6:25398
Sorptive Properties
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases. Quarterly technical progress report, December 19, 1980-March 18, 1981, 6:24851 (DOE/ET/14809—6)
SILICATES
Annual Variations
Annual nutrient cycles in a marine microcosm, 6:26242

Quantitative Chemical Analysis
Elemental concentrations in the United States Geological Survey's geochemical exploration reference samples: a review, 6:26432

SILICON
Activation Analysis
Determination of uranium and thorium in semiconductor memory materials by high fluence neutron activation analysis, 6:25965 (CONF-810682—3)
Carbon Additions
ESR in CVD silicon and silicon-carbon alloys, 6:25961
Chemical Preparation
Preparation of high-purity silicon using thermite reactions. Final report, October 1, 1979-November 30, 1980, 6:25905 (IS—4762)
Chemical Vapor Deposition
Stabilized CVD amorphous silicon for high temperature photothermal solar energy conversion, 6:25376
Corrosion
Investigation of photoelectrochemical corrosion of semiconductors. Final report, 15 April 1980-15 April 1981, 6:25954 (SERI/TR—8002-6-T1)
Crystal Doping
Stabilized CVD amorphous silicon for high temperature photothermal solar energy conversion, 6:25376
Crystal Growth
Evaluation and verification of epitaxial process sequence for silicon solar-cell production. Quarterly report No. 1, 6:25251 (DOE/JPL/955825—81/1)
Deposition
Diagnostics of a glow discharge used to produce hydrogenated amorphous silicon films. Final report, February 15, 1980-April 14, 1981, 6:25264 (SERI/TR—9053-1-T3)
Electron Spin Resonance
ESR in CVD silicon and silicon-carbon alloys, 6:25961
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883
Epitaxy
Evaluation and verification of epitaxial process sequence for silicon solar-cell production. Quarterly report No. 1, 6:25251 (DOE/JPL/955825—81/1)
Low-cost epitaxial techniques for solar-cell fabrication. Final report, 25 September 1979-24 September 1980, 6:25263 (SERI/TR—8274-1-T1)
Hydrogenation
Diagnostics of a glow discharge used to produce hydrogenated amorphous silicon films. Final report, February 15, 1980-April 14, 1981, 6:25264 (SERI/TR—9053-1-T3)
Preparation and characterization of hydrogenated amorphous silicon. Quarterly progress report No. 7, 1 December-28 February 1981, 6:25258 (SERI/PR—8142-4-T2)
Ion Microprobe Analysis
Preparation and characterization of hydrogenated amorphous silicon. Quarterly progress report No. 7, 1 December-28 February 1981, 6:25258 (SERI/PR—8142-4-T2)
Mass Spectroscopy
Preparation and characterization of hydrogenated amorphous silicon. Quarterly progress report No. 7, 1 December-28 February 1981, 6:25258 (SERI/PR—8142-4-T2)
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
Optical Properties
Optical properties of heavily doped silicon between 1.5 and 4.1 eV, 6:26438
Production
Low-cost-silicon-process development. Phase IV: process improvement. Second quarterly technical progress report, 6:25259 (SERI/PR—8279-1-T2)
Stabilization
Stabilized CVD amorphous silicon for high temperature photothermal solar energy conversion, 6:25376

SILICON 29
Nuclear Magnetic Resonance
Development and application of analytical techniques to chemistry of donor solvent liquefaction. Quarterly progress report, April 1980-June 1980, 6:25968 (DOE/PC/30041—T2)

SILICON ALLOYS
Magnetic Properties
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
Superconductivity
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)

SILICON CARBIDES
Nondestructive Testing
Development of nondestructive-evaluation techniques for high-temperature ceramic heat-exchanger components. Semiannual report, October 1980-March 1981, 6:25934 (ANL/MSD/FE—81-1)

SILICON FLUORIDES
Reduction
Preparation of high-purity silicon using thermite reactions. Final report, October 1, 1979-November 30, 1980, 6:25905 (IS—4762)

SILICON HYDRIDES
See SILANES

SILICON SEMICONDUCTOR DETECTORS
See SI SEMICONDUCTOR DETECTORS

SILICON SOLAR CELLS
Crystal Defects
Effects of intragrain defects on the local photoresponse of polycrystalline silicon solar cells, 6:25271
Efficiency
Loss mechanism analysis in single-crystal and polycrystalline silicon MIS solar cells to produce 13% efficiency, 6:25269
Low-cost epitaxial techniques for solar-cell fabrication. Final report, 25 September 1979-24 September 1980, 6:25263 (SERI/TR—8274-1-T1)
Electric Contacts
Molybdenum-tin as a solar cell metallization system, 6:25279
Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space, 6:25381
Energy Losses
Loss mechanism analysis in single-crystal and polycrystalline silicon MIS solar cells to produce 13% efficiency, 6:25269
Fabrication
Low-cost epitaxial techniques for solar-cell fabrication. Final report, 25 September 1979-24 September 1980, 6:25263 (SERI/TR—8274-1-T1)
Preparation of high-purity silicon using thermite reactions. Final report, October 1, 1979-November 30, 1980, 6:25905 (IS—4762)
Properties of polycrystalline silicon solar cells with controlled titanium additions, 6:25274
Grain Boundaries
Photovoltaic mechanisms in polycrystalline thin-film silicon solar cells. Quarterly report No. 6, November 1, 1980-January 31, 1981, 6:25249 (DOE/ET/23108—7)
Impurities
Silicon materials task of the low-cost solar-array project. Phase IV. Effects of impurities and processing on silicon solar cells. Twenty-second quarterly report, January 1981-March 1981, 6:25250 (DOE/JPL/954331—81/14)
Optimization
Photovoltaic mechanisms in polycrystalline thin-film silicon solar cells. Quarterly report No. 6, November 1, 1980-January 31, 1981, 6:25249 (DOE/ET/23108—7)
Performance
Silicon materials task of the low-cost solar-array project. Phase IV. Effects of impurities and processing on silicon solar cells. Twenty-second quarterly report, January 1981-March 1981, 6:25250 (DOE/JPL/954331—81/14)

Photosensitivity
Effects of intragrain defects on the local photoresponse of polycrystalline silicon solar cells, 6:25271
Process Development Units
Low-cost solar-array project production process and equipment task: a module experimental-process system-development unit (MEPSDU). Quarterly report No. 2, March 1, 1981-May 31, 1981, 6:25252 (DOE/JPL/955909—81/2)
Quantum Efficiency
Photovoltaic mechanisms in polycrystalline thin-film silicon solar cells. Quarterly report No. 6, November 1, 1980-January 31, 1981, 6:25249 (DOE/ET/23108—7)
Thermochemical Processes
Silicon materials task of the low-cost solar-array project. Phase IV. Effects of impurities and processing on silicon solar cells. Twenty-second quarterly report, January 1981-March 1981, 6:25250 (DOE/JPL/954331—81/14)

SILICONES
Chemical Preparation
Evaluation of organic peroxides as curing agents for methylphenylvinyl-siloxane elastomers used for cellular silicone cushions, 6:25941 (UCRL—53124)

SILVER
Electron Collisions
Radiation from silver films bombarded by low-energy electrons, 6:26472
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)

SILVER 103
Isotope Production
Production, radiochemistry, and cross-section measurements for ^{103}-^{105}Ag, 6:26009
Radiochemistry
Production, radiochemistry, and cross-section measurements for ^{103}-^{105}Ag, 6:26009

SILVER 104
Isotope Production
Production, radiochemistry, and cross-section measurements for ^{103}-^{105}Ag, 6:26009
Radiochemistry
Production, radiochemistry, and cross-section measurements for ^{103}-^{105}Ag, 6:26009

SILVER 105
Isotope Production
Production, radiochemistry, and cross-section measurements for ^{103}-^{105}Ag, 6:26009
Radiochemistry
Production, radiochemistry, and cross-section measurements for ^{103}-^{105}Ag, 6:26009

SINTERING
Chemical Reactions
Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980, 6:24929 (IS—4773)

SKIN
Luminescence
Lightpipe luminoscope for monitoring occupational skin contamination, 6:26094

SLAGS
Chemical Composition
Plan for sale, use, or disposition of demonstration plant products and by-products. Phase I: the Pipeline Gas Demonstration Plant, 6:24848 (DOE/ET/13060—T4)
Melting Points
Use of fuel additives in coal firing, 6:24960 (EPRI-WS—80-127)

SLUDGES
Contamination
Effects of moisture content on long-term survival and regrowth of bacteria in wastewater sludge, 6:26313
Waste Disposal
Potential effects on groundwater of fly ash and FGD waste disposal in lignite surface mine pits in North Dakota, 6:24927 (EPA/600/9—81-019B)

SLURRIES (FUEL)
See FUEL SLURRIES

SLURRY PIPELINES
Bibliographies
Issues associated with coal-slurry-pipeline development (Including brief description of 10 proposed slurry pipelines; also state water laws), 6:24945 (ANL/EES-TM—139)
Legal Aspects
Issues associated with coal-slurry-pipeline development (Including brief description of 10 proposed slurry pipelines; also state water laws), 6:24945 (ANL/EES-TM—139)
Maps
Issues associated with coal-slurry-pipeline development (Including brief description of 10 proposed slurry pipelines; also state water laws), 6:24945 (ANL/EES-TM—139)
Political Aspects
Issues associated with coal-slurry-pipeline development (Including brief description of 10 proposed slurry pipelines; also state water laws), 6:24945 (ANL/EES-TM—139)

SMALL BUSINESSES
Directories
Minority-owned small business directory: appendix C, 6:25223 (DOE/MI/01002—T5(App.C))
Energy Conservation
Project Monitor: Part II. Conservation in small business: an exploratory study. Final report, 6:25718 (DOE/CS/10220—T1)
Minority Groups
Minority-owned small business directory: appendix C, 6:25223 (DOE/MI/01002—T5(App.C))
Surveys
Identification of business opportunities for the minority-owned small businesses in the solar energy area. Final report, July 1980-January 1981, 6:25218 (DOE/MI/01002—T5)

SMALL-SCALE HYDROELECTRIC POWER PLANTS
Capacity
Small-scale hydro in New England: 1960-1976, 6:25215
Economic Analysis
Net energy of seven small-scale hydroelectric power plants, 6:25214 (ORNL/TM—7694)
Small-scale hydro in New England: 1960-1976, 6:25215
Electric Generators
Small hydro plant development program. Volume 1. Text, 6:25209 (DOE/ID/01570—T21(Vol.1))
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)
Feasibility Studies
Small hydroelectric potential at existing hydraulic structures in California. Bulletin 211, 6:25208 (DOE/R9/10019—T2)
Small hydroelectric potential at existing hydraulic structures in California. Appendixes: data and guidelines for development. Bulletin 211, 6:25207 (DOE/R9/10019—T1)
Financing
Financing of private small scale hydroelectric projects: a summary guide, 6:25598 (DOE/CE/04934—46)
Small hydroelectric potential at existing hydraulic structures in California. Appendixes: data and guidelines for development. Bulletin 211, 6:25207 (DOE/R9/10019—T1)
Licensing
Small hydroelectric potential at existing hydraulic structures in California. Appendixes: data and guidelines for development. Bulletin 211, 6:25207 (DOE/R9/10019—T1)
Small-scale hydro in New England: 1960-1976, 6:25215
Net Energy
Net energy of seven small-scale hydroelectric power plants, 6:25214 (ORNL/TM—7694)
Pump Turbines
Small hydro plant development program. Volume 1. Text, 6:25209 (DOE/ID/01570—T21(Vol.1))
Small hydro plant development program, 6:25211 (DOE/ID/01570—T21(Vol.2)App.A-K)
Small hydro plant development program, 6:25212 (DOE/ID/01570—T21Vol.3App.L)

SMOKES
Air Pollution Control
USAF aircraft engine emission goals: a critical review. Final report Sep 78-Jun 79, 6:25853 (AD—A-090282)
SNAILS
Tolerance
Environment and snails (Gastropoda): studies of 1000 lakes in Norway, 6:26374 (CONF-800365—)
SNOW
Acidification
Acidity of Antarctic snow: a natural reference level for acid rains, 6:26181 (CONF-800365—)
Chemical Composition
Sources of acidity in three lakes acidified during snowmelt, 6:26270 (CONF-800365—)
Streamwater chemistry before, during and after snowmelt, 6:26254 (CONF-800365—)
Quantitative Chemical Analysis
Snow pack storage and ion release, 6:26190 (CONF-800365—)
SOCIO-ECONOMIC FACTORS
Standardization
Mortality in 191 counties near energy facilities: use of economic and social variables for standardization, 6:26393
SODA ASH
See SODIUM CARBONATES
SODIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Energy Transfer
Energy transfer from PO excited states to alkali metal atoms in the phosphorus chemiluminescence flame, 6:25988
Ion Collisions
H^- and D^- production by backscattering from surfaces, 6:26454 (LBL—12454)
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies $\leqq$ 400 MeV, 6:26610 (ORNL/TM—7818)
Purification
Design criteria and candidate concept for high-performance cold trap, 6:25491 (DOE/SF/00893—T4)
SODIUM CARBONATES
Chemical Reactions
Chemical studies of the Ames oxydesulfurization process, 6:24911
Desulfurization of coal by oxidation in alkaline solutions, 6:24867 (IS-M—318)
SODIUM CHLORIDES
Phase Studies
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))
Studies of aqueous solutions and microemulsions for enhanced oil recovery processes, 6:25053 (DOE/BETC/IC—80/3(Vol.2))
SODIUM COMPOUNDS
Chemical Reactions
Desulfurization of coal by oxidation in alkaline solutions, 6:24867 (IS-M—318)
Oxidations of Illinois No. 6 coal at and below 60°C (Oxidizing agents are sodium hypochlorite, nitric acid and potassium butoxide), 6:24910
Phase Studies
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))
SODIUM HYDROXIDES
Latent Heat Storage
Extended development of a sodium hydroxide thermal-energy storage module, 6:25579 (DOE/NASA/0138—1)
High-temperature phase change thermal storage, 6:25766 (CONF-800272—)
SODIUM SULFATES
Chemical Reaction Yield
Combustion-system processes leading to corrosive deposits, 6:26010 (DOE/NASA/2593—27)
SODIUM-SULFUR BATTERIES
Solid Electrolytes
Performance of sodium-beta alumina solid electrolyte in Na/S cells, 6:25588 (LBL—12657)
SOFT X RADIATION
X-Ray Detection
Photoemission measurements for low energy x-ray detector applications, 6:26609 (LA-UR—81-1712)
SOILS
Acidification
Acidification effect of urea and sulfur application on the forest soil in a percolation experiment, 6:26185 (CONF-800365—)
Effects of acid precipitation on soil and forest. 1. Methods of the field experiments, 6:26350 (CONF-800365—)
Effects of acid precipitation on soil and forest. 5. Release and loss of nutrients from a Norwegian forest soil due to artificial rain of varying acidity, 6:26188 (CONF-800365—)
Effects of acid precipitation on soil and forest. 10. The effect of growth of Norway spruce on soil acidity by acid irrigation, 6:26357 (CONF-800365—)
Soil acidification by SO_2 emissions in Alberta, Canada, 6:26141 (CONF-800365—)
Biogeochemistry
Impact of acid precipitation on forest canopies and soils in the northeastern US, 6:26343 (CONF-800365—)
Buffers
Acid precipitation and soil buffering capacity, 6:26336 (CONF-800365—)
Chemical Composition
Effects of acid precipitation on soil and forest. 6. Lysimeter experiment in greenhouse, 6:26353 (CONF-800365—)
Flow Models
Water residence distributions, 6:26205 (CONF-800365—)
Heat Transfer
Analytical models for simultaneous heat and moisture transport in soils, 6:25140 (RHO-LD—49)
Leaching
Microcosm evaluation of the agricultural potential of fly-ash-amended soils, 6:26203
Moisture
Analytical models for simultaneous heat and moisture transport in soils, 6:25140 (RHO-LD—49)
PH Value
Importance of natural H^+ production for acidity in soil and water, 6:26260 (CONF-800365—)
Soil resampling and pH measurements after an 18-year period in Ontario, 6:26184 (CONF-800365—)
Physical Properties
Microbial trophic structure and habitable pore space in soil, 6:26180
Quantitative Chemical Analysis
Effects of simulated rain on the effluent from lysimeters with acid, shallow soil, rich in organic matter, 6:26139 (CONF-800365—)
Sorptive Properties
Effects of acid precipitation on soil and forest. 3. Sulfate sorption by acid forest soils, 6:26187 (CONF-800365—)
Temperature Distribution
Investigations into ground climate as an alternative thermal building environment, 6:26194 (CONF-800438—)
Temperature Gradients
Investigations into ground climate as an alternative thermal building environment, 6:26194 (CONF-800438—)
Temperature Measurement
Investigations into ground climate as an alternative thermal building environment, 6:26194 (CONF-800438—)
Weathering
Effect of chemical weathering on surface waters, 6:26276 (CONF-800365—)

SOLAR ABSORBERS
Deformation
Continuous-System-Modeling Program III: simulation of a solar collector under stagnation conditions, 6:25379 (CONF-800804—39)
Materials
Basic research needs and opportunities at the solid/gas interface, 6:25244 (CONF-8006156—)
Refractivity
Graded-index Pt-Al_2O_3 composite solar absorbers, 6:25265
Thermal Stresses
Continuous-System-Modeling Program III: simulation of a solar collector under stagnation conditions, 6:25379 (CONF-800804—39)
SOLAR ACCESS
Institutional Factors
Overcoming land-use barriers to solar access: solar planning recommendations for local communities, 6:25230 (DOE/TIC—1025039)
Legal Aspects
Overcoming land-use barriers to solar access: solar planning recommendations for local communities, 6:25230 (DOE/TIC—1025039)
SOLAR AIR CONDITIONERS
Design
Development of a high temperature solar powered water chiller. Volume I. Phase II: technical progress report, June 1, 1978-March 31, 1979, 6:25335 (DOE/CS/31590—)
Vapor Compression Refrigeration Cycle
Development of a high temperature solar powered water chiller. Volume I. Phase II: technical progress report, June 1, 1978-March 31, 1979, 6:25335 (DOE/CS/31590—)
SOLAR CELL ARRAYS
See also PHOTOVOLTAIC POWER SUPPLIES
Bonding
High temperature bonding techniques for solar cell array. Final report Mar 76-Jun 77, 6:25293 (AD—B028686/4)
Fouling
Airborne particulate soiling of terrestrial photovoltaic modules and cover materials, 6:25287
Potting
Quantitative method for photovoltaic encapsulation system optimization, 6:25278
SOLAR CELL RECEIVERS
See SOLAR RECEIVERS
SOLAR CELLS
See also CADMIUM SULFIDE SOLAR CELLS
CADMIUM TELLURIDE SOLAR CELLS
SILICON SOLAR CELLS
Electrical Properties
Heterojunction solar cells on cuprous oxide, 6:25272
Fabrication
Heterojunction solar cells on cuprous oxide, 6:25272
SOLAR COLLECTORS
See also FLAT PLATE COLLECTORS
PARABOLIC TROUGH COLLECTORS
Black Coatings
Microstructural and mechanical property evaluation of zinc oxide coated solar collectors, 6:25384
Coatings
Basic research needs and opportunities at the solid/solid interface: adhesion, abrasion, and polymer coatings, 6:25245 (CONF-8006156—)
Basic research needs and opportunities in thin films and coatings, 6:25246 (CONF-8006156—)
Microstructural and mechanical property evaluation of black-chrome coated solar collectors. II, 6:25385
Comparative Evaluations
Overview of solar system design and application principles, 6:25378 (CONF-790203—)
Design
Overview of solar system design and application principles, 6:25378 (CONF-790203—)
Elastomers
Low-cost, efficient and durable low-temperature solar collector, 6:25386
Films
Basic research needs and opportunities in thin films and coatings, 6:25246 (CONF-8006156—)
Heat Losses
Overview of solar system design and application principles, 6:25378 (CONF-790203—)
Materials
Twenty-sixth national SAMPE symposium and exhibition. Volume 26. Material and process applications: land, sea, air, space, 6:25381
Performance Testing
Overview of solar system design and application principles, 6:25378 (CONF-790203—)
SOLAR COOLING SYSTEMS
See also SOLAR AIR CONDITIONERS
Computer Codes
Solar heating and cooling (SHAC) simulation programs: assessment and evaluation. Volume 2. Detailed findings. Final report, 6:25343 (EPRI-EM—1866(Vol.2))
Data Base Management
Solar data base management system, 6:25326 (CONF-800804—40)
Demonstration Programs
Alternate Home Energy Application and Demonstration: Project AHEAD. Final report, 6:25342 (DOE/R5/10112—T1)
Design
Development of a high temperature solar powered water chiller. Volume I. Phase II: technical progress report, June 1, 1978-March 31, 1979, 6:25335 (DOE/CS/31590—)
Materials Testing
Solar data base management system, 6:25326 (CONF-800804—40)
Performance
Solar-energy-system performance evaluation: Dallas Recreation Center, Dallas, Texas. March-November 1980, 6:25352 (SOLAR/2038—81/14)
Reliability
Solar data base management system, 6:25326 (CONF-800804—40)
Vapor Compression Refrigeration Cycle
Development of a high temperature solar powered water chiller. Volume I. Phase II: technical progress report, June 1, 1978-March 31, 1979, 6:25335 (DOE/CS/31590—)
SOLAR DRYERS
Design
Solar energy systems for agricultural and industrial process drying, 6:25361
SOLAR DRYING
Design
Solar drying of seafood products, 6:25359
SOLAR ENERGY
Handbook for the marketing of conservation and solar-energy programs, 6:25849 (DOE/CS/10210—T2)
Advertising
Solar Audience Test summary report. Task Assignment No. 3, 6:25217 (DOE/CS/10070—T1)
Attitudes
Information and the solar consumer, 6:25220 (SERI/TP—753-1205)
Solar Audience Test summary report. Task Assignment No. 3, 6:25217 (DOE/CS/10070—T1)
Bibliographies
Solar energy legal bibliography: second update (100 references), 6:25231 (SERI/TR—744-876)
Demonstration Programs
Solar Program Directory: appendix A, 6:25222 (DOE/MI/01002—T5(App.A))
Directories
Solar Program Directory: appendix A, 6:25222 (DOE/MI/01002—T5(App.A))
Heat Storage
Thermal energy storage for solar thermal applications program. Progress report, April 1980-March 1981, 6:25580 (SAND—81-8225)

Information
Information and the solar consumer, 6:25220 (SERI/TP—753-1205)
Legal Aspects
Solar energy legal bibliography: second update (100 references), 6:25231 (SERI/TR—744-876)
Meetings
Agricultural energy. Volume 3. Food processing, 6:25812
Interregional symposium on solar energy for development, 6:25216 (CONF-790203—)
Research Programs
Heat transfer and the future of solar energy utilization, 6:25221
Interregional symposium on solar energy for development, 6:25216 (CONF-790203—)
Solar Program Directory: appendix A, 6:25222 (DOE/MI/01002—T5(App.A))

SOLAR ENERGY CONVERSION
Economic Analysis
Design requirements for interfaces in solar energy conversion technologies, 6:25235 (CONF-8006156—)
Equipment
Basic research needs and opportunities for characterizing the microstructure and microchemistry of interfaces, 6:25247 (CONF-8006156—)
Limitation of experimental capabilities for interfacial studies, 6:25240 (CONF-8006156—)
Interfaces
Interfacial phenomena in solar materials, 6:25236 (CONF-8006156—)
Liquid-Metal MHD Generators
Liquid-metal MHD for solar and coal, 6:25646 (CONF-800617—8)
Liquid-metal MHD for solar and coal: system and component status, 6:25648 (CONF-800806—42)
Materials
Basic research needs and opportunities on interfaces in solar materials, 6:25232 (CONF-8006156—)
Basic research needs and opportunities at the solid/gas interface, 6:25244 (CONF-8006156—)
Design requirements for interfaces in solar energy conversion technologies, 6:25235 (CONF-8006156—)
Executive summary, 6:25233 (CONF-8006156—)
Interfacial phenomena in solar materials, 6:25236 (CONF-8006156—)
Overview of the solid/solid interface: mechanical stability, 6:25237 (CONF-8006156—)
Overview of current status of solid-gas interface science, 6:25239 (CONF-8006156—)
Meetings
Basic research needs and opportunities on interfaces in solar materials, 6:25232 (CONF-8006156—)
Research Programs
Basic research needs and opportunities at the solid/solid interface: diffusion, 6:25242 (CONF-8006156—)
Basic research needs and opportunities at the solid-liquid interface, 6:25243 (CONF-8006156—)
Reviews
Overview of solar energy conversion technologies: quantum processes and thermal processes (51 references), 6:25234 (CONF-8006156—)

SOLAR EQUIPMENT
See also HELIOSTATS
PHOTOELECTROCHEMICAL CELLS
PHOTOVOLTAIC POWER SUPPLIES
SOLAR ABSORBERS
SOLAR CELL ARRAYS
SOLAR CELLS
SOLAR COLLECTORS
SOLAR COOLING SYSTEMS
SOLAR DRYERS
SOLAR HEATING SYSTEMS
SOLAR REGENERATORS
SOLAR WATER HEATERS
SPECTRALLY SELECTIVE SURFACES
Reliability
Identification of product and material differences in active solar systems, 6:25322 (ANL-K—81-74)

SOLAR HEATING SYSTEMS
See also PASSIVE SOLAR HEATING SYSTEMS
SOLAR-ASSISTED HEAT PUMPS
Annual Energy Storage
Longterm solar heat storage in an underground water cistern retrofitted with thermal insulation. Final technical report, May 15, 1979-March 31, 1981, 6:25380 (DOE/R5/10106—3)
Computer Codes
Solar heating and cooling (SHAC) simulation programs: assessment and evaluation. Volume 2. Detailed findings. Final report, 6:25343 (EPRI-EM—1866(Vol.2))
Construction
Upland Hills Ecological Awareness Center solar air-heating system: control, monitoring, and documentation grant. Final report, 6:25377 (DOE/R5/10123—1)
Control Systems
Dynamic modeling and experimental simulation of active solar energy systems for the evaluation of control strategies, 6:25360
Data Base Management
Solar data base management system, 6:25326 (CONF-800804—40)
Demonstration Programs
Alternate Home Energy Application and Demonstration: Project AHEAD. Final report, 6:25342 (DOE/R5/10112—T1)
Design
Haverhill solar energy project: preliminary design report, 6:25331 (DOE/CS/30310—T2)
Kube Pak commercial greenhouse solar demonstration project, 6:25356
Oakmead solar buildings, 6:25333 (DOE/CS/31521—T1)
Solar heating and hot water system installed at Alderson Broaddus College, Philippi, West Virginia, 6:25341 (DOE/NASA/CR—161756)
Solar production of intermediate-temperature process heat, phase I design. Preliminary design report, 6:25332 (DOE/CS/30311—T2)
Economic Analysis
Haverhill solar energy project: economic analysis, 6:25330 (DOE/CS/30310—T1)
Solar energy system economic evaluation for IBM System 1B, Carlsbad, New Mexico. Final report, 6:25340 (DOE/NASA/CR—161730)
Evaluation
Medium-temperature air-heater development program. Final report, October 1, 1977-December 31, 1978, 6:25336 (DOE/CS/34126—T1)
Materials Testing
Solar data base management system, 6:25326 (CONF-800804—40)
Payback Period
Group solar housing, 6:25371
Performance
Analysis and summary of a solar air collector-groundwater heat storage-greenhouse heating system, 6:25354
Kube Pak commercial greenhouse solar demonstration project, 6:25356
Solar-energy-system performance evaluation: Dallas Recreation Center, Dallas, Texas. March-November 1980, 6:25352 (SOLAR/2038—81/14)
Reliability
Solar data base management system, 6:25326 (CONF-800804—40)

SOLAR INDUSTRY
Solar Water Heaters
Comparison of conventional and solar-water-heating products and industries report, 6:25328 (DOE/CS/30217—T1)
Surveys
Identification of product and material differences in active solar systems, 6:25322 (ANL-K—81-74)
Identification of business opportunities for the minority-owned small businesses in the solar energy area. Final report, July 1980-January 1981, 6:25218 (DOE/MI/01002—T5)

SOLAR PROCESS HEAT
Application of solar thermal energy to buildings and industry, 6:25349 (SERI/TP—641-1222)
Central receiver steam systems for industrial process heat applications, 6:25347 (SAND—81-8223)

Solar energy systems for agricultural and industrial process drying, 6:25361
Solar production of intermediate-temperature process heat, phase I design. Preliminary design report, 6:25332 (DOE/CS/30311—T2)

Economic Analysis
Haverhill solar energy project: economic analysis, 6:25330 (DOE/CS/30310—T1)

Economics
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)

Equipment
Haverhill solar energy project: preliminary design report, 6:25331 (DOE/CS/30310—T2)

Marketing Research
Industrial applications analysis: market characterization and system definition for several industries, 6:25348 (SERI/TP—353-467)
Solar industrial process heat: a study of applications and attitudes. Final report, 6:25350 (SERI/TR—98348-1)

Regional Analysis
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)

SOLAR RADIATION
See also DIFFUSE SOLAR RADIATION

Monitoring
Diffuse sky measurements and determination of corrected shadow band multiplication factors, 6:25228

SOLAR RECEIVERS
See also CENTRAL RECEIVERS

Performance
High temperature solar thermal technology, 6:25310

SOLAR REGENERATORS
Solid desiccant regeneration by direct solar energy for fresh fruit drying, 6:25357

SOLAR RIGHTS

Bibliographies
Solar energy legal bibliography: second update (100 references), 6:25231 (SERI/TR—744-876)

Institutional Factors
Overcoming land-use barriers to solar access: solar planning recommendations for local communities, 6:25230 (DOE/TIC—1025039)

SOLAR SPACE HEATING

Evaluation
Medium-temperature air-heater development program. Final report, October 1, 1977-December 31, 1978, 6:25336 (DOE/CS/34126—T1)

SOLAR THERMAL POWER PLANTS
See also TOWER FOCUS POWER PLANTS

Design
Alternative configurations for sodium-cooled solar thermal power plants, 6:25312

Energy Storage
Storage in residential solar total-energy systems, 6:25389 (BNL—51230)

Heat Storage
High temperature solar thermal technology, 6:25310
Thermal storage requirements for parabolic dish solar power plants, 6:25311

Parabolic Dish Collectors
Thermal storage requirements for parabolic dish solar power plants, 6:25311

Parametric Analysis
Alternative configurations for sodium-cooled solar thermal power plants, 6:25312

Rankine Cycle Engines
Binary Rankine-cycle engines for solar-thermal power systems, 6:25309

Solar Receivers
High temperature solar thermal technology, 6:25310

SOLAR THERMAL RECEIVERS
See SOLAR RECEIVERS

SOLAR WATER HEATERS

Cost Benefit Analysis
Application of proactive behavioral techniques for the promotion of solar retrofit in condominiums: the Friars Village case study, 6:25327 (DOE/CS/10210—T1)

Design
Hot water from the sun: a consumer guide to solar water heating, 6:25344 (HUD-PDR—548)
Solar heating and hot water system installed at Alderson Broaddus College, Philippi, West Virginia, 6:25341 (DOE/NASA/CR—161756)
Solar space- and water-heating system at Stanford University. Final report, 6:25334 (DOE/CS/31522—T2)

Economic Analysis
Solar energy system economic evaluation for IBM System 1B, Carlsbad, New Mexico. Final report, 6:25340 (DOE/NASA/CR—161730)

Economics
Comparison of conventional and solar-water-heating products and industries report, 6:25328 (DOE/CS/30217—T1)

Energy Efficiency
Comparison of conventional and solar-water-heating products and industries report, 6:25328 (DOE/CS/30217—T1)

Evaluation
Medium-temperature air-heater development program. Final report, October 1, 1977-December 31, 1978, 6:25336 (DOE/CS/34126—T1)

Manuals
Hot water from the sun: a consumer guide to solar water heating, 6:25344 (HUD-PDR—548)

Marketing Research
Application of proactive behavioral techniques for the promotion of solar retrofit in condominiums: the Friars Village case study, 6:25327 (DOE/CS/10210—T1)

Operation
Solar space- and water-heating system at Stanford University. Final report, 6:25334 (DOE/CS/31522—T2)

Performance
Solar-energy-system performance evaluation: Dallas Recreation Center, Dallas, Texas. March-November 1980, 6:25352 (SOLAR/2038—81/14)

Retrofitting
Application of proactive behavioral techniques for the promotion of solar retrofit in condominiums: the Friars Village case study, 6:25327 (DOE/CS/10210—T1)

Thermal Efficiency
Comparison of conventional and solar-water-heating products and industries report, 6:25328 (DOE/CS/30217—T1)

SOLAR-ASSISTED HEAT PUMPS

Performance
Series-parallel solar-augmented rock-bed heat pump. Final report, 6:25338 (DOE/CS/34697—T3)

SOLID ELECTROLYTES

Failures
Performance of sodium-beta alumina solid electrolyte in Na/S cells, 6:25588 (LBL—12657)

SOLID WASTES
See also AGRICULTURAL WASTES
WOOD WASTES

Anaerobic Digestion
Refuse conversion to methane (RefCOM): a proof-of-concept anaerobic digestion facility, 6:25187

Combustion
Mass burning of municipal solid waste - worldwide, 6:25846

Gasification
Thermal conversion of solid wastes and biomass, 6:25183

Liquefaction
Thermal conversion of solid wastes and biomass, 6:25183

Pyrolysis
Integrated system for solid waste disposal with energy recovery and volumetric reduction by a new pyrolysis furnace, 6:25189
Thermal conversion of solid wastes and biomass, 6:25183

Resource Potential
Waste as a fuel, 6:25785 (CONF-7910214—)

SOLIDS
Chemical Analysis
Limitations of ion etching for interface analysis (107 references), 6:25241 (CONF-8006156—)
Diffusion
Basic research needs and opportunities at the solid/solid interface: diffusion, 6:25242 (CONF-8006156—)
Electronic Structure
Research with x rays, 6:26093
Etching
Limitations of ion etching for interface analysis (107 references), 6:25241 (CONF-8006156—)
Impact Tests
Sandia 25-meter compressed helium/air gun, 6:26046 (SAND—81-1477C)
Interfaces
Overview of current status of solid/liquid interface science, 6:25238 (CONF-8006156—)
Overview of current status of solid-gas interface science, 6:25239 (CONF-8006156—)
VII. Overview of current status of solid-gas interface science, 6:25979 (IS-M—316)
SOLVENT-REFINED COAL
Chemical Composition
Trace metal distribution in fractions of solvent-refined coal by icp-oes and implications regarding metal speciation, 6:24917
Emission Spectroscopy
Trace metal distribution in fractions of solvent-refined coal by icp-oes and implications regarding metal speciation, 6:24917
Fuel Substitution
Economic and environmental tradeoffs in coal conversion, 6:25638 (CONF-800608—8)
Molecular Weight
Separation and characterization of lignite derived preasphaltenes by gel permeation chromatography and nuclear magnetic resonance spectrometry, 6:24914
Solvent Extraction
Separation and characterization of lignite derived preasphaltenes by gel permeation chromatography and nuclear magnetic resonance spectrometry, 6:24914
SOLVENT-REFINING COAL PLANTS
See SRC PROCESS
SOLVENTS
See also ORGANIC SOLVENTS
Chemical Analysis
Separation and characterization of polycyclic aromatic hydrocarbons and alkylphenols in coal derived solvents, 6:24915
Comparative Evaluations
Evaluation of the donor ability of coal liquefaction solvents, 6:24874
Monitoring
Lightpipe luminoscope for monitoring occupational skin contamination, 6:26094
SOOT
Aerosol Monitoring
Soot in urban atmospheres, 6:26148 (LBL—10881)
Atmospheric Chemistry
Soot in urban atmospheres, 6:26148 (LBL—10881)
Chemical Reaction Yield
Soot volume-fraction profiles in a free-combusting boundary layer, 6:26011 (LBL—12767)
Particle Size
Soot volume-fraction profiles in a free-combusting boundary layer, 6:26011 (LBL—12767)
SORBENT RECOVERY SYSTEMS
Bauxite
Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)
Performance
Alkali metal vapor removal from pressurized fluidized-bed combustor flue gas: activated bauxite sorbent regeneration. Quarterly report, October-December 1980, 6:25436 (ANL/CEN/FE—80-24)
SOUTH CAROLINA
Wind Power
Techniques for assessing the wind energy resource in the Southeast region, 6:25416 (PNL—3669)
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)
SOUTH DAKOTA
Wind Power
Techniques for assessing the wind energy resource in the North Central region, 6:25414 (PNL—3667)
SOUTHWEST REGION
See also ARKANSAS
NEW MEXICO
OKLAHOMA
TEXAS
Insolation
Solar-meteorological research program for the South-Central US, 6:25226
Meteorology
Solar-meteorological research program for the South-Central US, 6:25226
SOYBEAN PLANT
See GLYCINE HISPIDA
SPACE HEATERS
Fuel Consumption
Energy: comparative energy consumption of space and water heating appliances, 6:25730
Performance Testing
Energy: comparative energy consumption of space and water heating appliances, 6:25730
SPACE LATTICES
See CRYSTAL LATTICES
SPACE POWER REACTORS
Radiation Hazards
Acceptability of reactors in space, 6:25527 (LA-UR—81-1371)
Risk Assessment
Acceptability of reactors in space, 6:25527 (LA-UR—81-1371)
SPACE PROPULSION REACTORS
Radiation Hazards
Acceptability of reactors in space, 6:25527 (LA-UR—81-1371)
Risk Assessment
Acceptability of reactors in space, 6:25527 (LA-UR—81-1371)
SPACE VEHICLES
Thermal Insulation
Heat transfer in refractory fiber insulations, 6:25760
SPACECRAFT POWER SUPPLIES
Thermoelectric Generators
Progress report No. 29 for a program of thermoelectric generator testing and RTG degradation mechanisms evaluation, 6:25657 (DOE/ET/33003—T2)
SPARK GAPS
Switches
10-joule high-voltage trigger micro Marx, 6:26699 (LA-UR—81-1641)
UV-laser-triggered switches, 6:26709 (SAND—81-0695C)
SPARK IGNITION ENGINES
Air Pollution
Exposure to pollutants from domestic combustion sources: a preliminary assessment. Final report Aug 79-Feb 80, 6:26153 (PB—81-111536)
Automotive Fuels
Maximizing efficiency of fuel production and utilization, 6:25856 (DOE/BETC/IC—80/3(Vol.4))
Fuel Economy
Automotive fuel economy: potential improvement through selected differential gear lubricants, 6:25857 (DOE/BETC/IC—80/3(Vol.4))
Maximizing efficiency of fuel production and utilization, 6:25856 (DOE/BETC/IC—80/3(Vol.4))
Fuels
Performance of a CFR engine burning simulated anaerobic digester's gas, 6:25893
Lubricating Oils
Automotive fuel economy: potential improvement through selected differential gear lubricants, 6:25857 (DOE/BETC/IC—80/3(Vol.4))

Performance
Performance of a CFR engine burning simulated anaerobic digester's gas, 6:25893
SPECTRAL REFLECTANCE
Reflectance modification through controlled surface texturing by sputter etching, 6:25383
SPECTRALLY SELECTIVE SURFACES
Electric Conductivity
Spectral selectivity of conducting micromeshes, 6:25388
SPECTROMETERS
See also GAMMA SPECTROMETERS
MAGNETIC SPECTROMETERS
X-RAY SPECTROMETERS
Tagged Photon Method
Use of the ECL-CAMAC trigger processor system for recoil missing mass triggers at the Tagged Photon Spectrometer at Fermilab, 6:26077 (FERMILAB-Conf—81/40-EXP)
Trigger Circuits
Use of the ECL-CAMAC trigger processor system for recoil missing mass triggers at the Tagged Photon Spectrometer at Fermilab, 6:26077 (FERMILAB-Conf—81/40-EXP)
SPECTROSCOPY
See also GAMMA SPECTROSCOPY
LASER SPECTROSCOPY
MASS SPECTROSCOPY
PHOTOACOUSTIC SPECTROSCOPY
Beam Optics
Spatial resolution for two-beam spectroscopy: a new mechanism, 6:26469
Spatial Resolution
Spatial resolution for two-beam spectroscopy: a new mechanism, 6:26469
SPEECH
Fourier Analysis
Speech processing based on short-time Fourier analysis, 6:26729 (UCRL—86104)
SPEECH SYNTHESIZERS
Enhancement of a radiation safety system through the use of a microprocessor-controlled speech synthesizer, 6:26076 (CONF-801103—59)
SPENT FUEL STORAGE
Department of Energy waste management program by the Office of Nuclear Waste Management, 6:25161
Encapsulation
Studies and research concerning BNFP design and construction of a spent-fuel disassembly/encapsulation system, 6:25101 (AGNS—47921-2.1-14)
Fuel Assembly Dismantling
Studies and research concerning BNFP design and construction of a spent-fuel disassembly/encapsulation system, 6:25101 (AGNS—47921-2.1-14)
Temperature Distribution
Thermal hydraulics of handling FFTF fuel in sodium and argon, comparing test results with calculated, 6:25494 (HEDL-SA—2203-FP)
SPENT FUELS
Reprocessing
Resource consequences of reenrichment versus blending, 6:25500 (HEDL-SA—2322-FP)
SPHERES
Impact Shock
Numerical modeling of oblique hypervelocity impact using two-dimensional plane strain models, 6:26023 (SAND—80-2865C)
SPHEROMAK DEVICES
Plasma Diagnostics
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear, 6:26634 (LA—8828-MS)
Research Programs
Annual report, October 1, 1979-September 30, 1980, 6:26643 (PPPL-Q—38)
SRC PROCESS
Air Pollution
Kentucky Department for Natural Resources and Environmental Protection: permit application for air contaminant source. Supplement II, 6:24857 (DOE/OR/03054—T5)
Demonstration Plants
Kentucky Department for Natural Resources and Environmental Protection: permit application for air contaminant source. Supplement II, 6:24857 (DOE/OR/03054—T5)
Modifications
Evaluation of a short-residence-time two-stage SRC process. Final report, 6:24861 (EPRI-AP—1827)
Permits
Kentucky Department for Natural Resources and Environmental Protection: permit application for air contaminant source. Supplement II, 6:24857 (DOE/OR/03054—T5)
Technology Assessment
Economic and environmental tradeoffs in coal conversion, 6:25638 (CONF-800608—8)
SRC-II PROCESS
Demonstration Plants
SRC-II demonstration program: a status report, 6:24895
Planning
SRC-II demonstration program: a status report, 6:24895
SR-OB REACTOR
See SUBCRITICAL ASSEMBLIES
STACKING FAULTS
Computerized Simulation
Energies of <110> coincidence twist boundaries, stacking faults, and free surfaces in metal oxides with NaCl structure, 6:26613 (CONF-800765—9)
STAINLESS STEEL-304
Decontamination
Decontamination of LMFBR components: report of FY 1979 results (GCA process), 6:25493 (DOE/SF/76026—T7)
Fatigue
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)
Mechanical Properties
Progress in understanding the mechanical behavior of pressure-vessel materials at elevated temperatures, 6:25899 (CONF-810625—18)
STAINLESS STEEL-304L
Physical Radiation Effects
Response to annealing and reirradiation of AISI 304L stainless steel following initial high-dose neutron irradiation in EBR-II, 6:25488 (CONF-800609—17)
STAINLESS STEEL-316
Decontamination
Decontamination of LMFBR components: report of FY 1979 results (GCA process), 6:25493 (DOE/SF/76026—T7)
Fatigue
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)
Mechanical Properties
Progress in understanding the mechanical behavior of pressure-vessel materials at elevated temperatures, 6:25899 (CONF-810625—18)
Microstructure
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)
Physical Radiation Effects
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)
Summary of comparative dual-ion-irradiation experiment on 316 stainless steel, 6:25909 (PNL-SA—9255)
STANDARDS
See also ENERGY EFFICIENCY STANDARDS
Steel plates for nuclear and other special applications (ASME SA-647 with additional requirements), 6:25498 (NE-M—5-23T(4/81)(Rev.))
Comparative Evaluations
Spiked sample standards; their uses and disadvantages in analytical quality control, 6:26169
STANDING CROP
See BIOMASS

STANFORD LINEAR ACCELERATOR CENTER
Computer Networks
Support and utilization of the LSI-11 processor family at SLAC, 6:26728 (SLAC-PUB—2727)
STARFIRE TOKAMAK
Breeding Blankets
Neutronic optimization of solid breeder blankets for STARFIRE design, 6:26682 (CONF-801011—98)
Coolants
Choice of coolant in commercial tokamak power plants, 6:26672 (CONF-801011—87)
Design
STARFIRE: a conceptual design of a commercial tokamak power plant. Paper IAEA-CN-39/E-1, 6:26667 (CONF-800707—26)
Steady-state tokamak reactor with non-divertor impurity control: STARFIRE, 6:26669 (CONF-800950—20)
High-Frequency Heating
Lower-hybrid heating and current drive system for the STARFIRE tokamak, 6:26628 (CONF-801011—97)
Limiters
Limiter/vacuum system for plasma impurity control and exhaust in tokamaks, 6:26681 (CONF-801011—96)
Steady-state tokamak reactor with non-divertor impurity control: STARFIRE, 6:26669 (CONF-800950—20)
Magnet Coils
Starfire poloidal coil systems, 6:26671 (CONF-801011—86)
Radiation Hazards
Tritium-handling considerations for ETF and STARFIRE, 6:26673 (CONF-801011—88)
Shielding
Importance of shield design in minimizing radioactive-material inventory in tokamaks, 6:26670 (CONF-801011—85)
Specifications
First-wall/blanket materials selection for STARFIRE tokamak reactor, 6:26680 (CONF-801011—95)
Overview of the STARFIRE reference commercial tokamak fusion power reactor design, 6:26679 (CONF-801011—94)
Thermonuclear Ignition
STARFIRE burn cycle, 6:26674 (CONF-801011—89)
Tritium Recovery
Analysis of in-situ tritium recovery from solid fusion-reactor blankets, 6:26675 (CONF-801011—90)
Vacuum Systems
Limiter/vacuum system for plasma impurity control and exhaust in tokamaks, 6:26681 (CONF-801011—96)
STATE GOVERNMENT
Emergency Plans
Commonwealth of Pennsylvania emergency preparedness and response: the Three Mile Island incident, 6:25566
Energy Models
State energy modeling. Volume I. An analysis of state energy modeling, 6:25591 (DOE/CS/10046—2(Vol.1))
Nuclear Power Plants
Reassessing the nuclear option: Three Mile Island from a state perspective, 6:25560
STATIONARY POLLUTANT SOURCES
(Used for general articles when sources are not named. See also specific stationary sources, e.g., Fossil-fuel Power Plants.)
See also AIR POLLUTION
Information Systems
Source Test Data (SOTDAT) System information, 6:26107 (PB—81-120578)
STEAM GENERATION
See also COGENERATION
Feasibility Studies
Energy recovery from municipal solid waste and sewage sludge using multisolid fluidized-bed combustion technology, 6:25205
Fuels
Economics of selected fuels for new industrial steam capacity, 6:25821
STEAM GENERATORS
Air Pollution Control
Industrial application of fluidized-bed combustion. Quarterly technical progress report, October-December, 1980, 6:26060 (DOE/ET/10381—150)
Demonstration Plants
Industrial application of fluidized-bed combustion. Quarterly technical progress report, October-December, 1980, 6:26060 (DOE/ET/10381—150)
Design
Forced-circulation steam generators designed and developed for energy recovery in industry, 6:25777 (CONF-800272—)
Energy Recovery
Forced-circulation steam generators designed and developed for energy recovery in industry, 6:25777 (CONF-800272—)
Fluidized-Bed Combustors
Industrial application of fluidized-bed combustion. Quarterly technical progress report, October-December, 1980, 6:26060 (DOE/ET/10381—150)
Leaks
In-plant source term measurements at Turkey Point Station - Units 3 and 4. Topical report, 6:25536 (NUREG/CR—1629)
Manufacturers
Economical and reliable disposal and solid waste by Combustion Engineering, Inc, the domestic supplier of energy systems worldwide, 6:26058 (ANL/CNSV-TM—60)
Molten Metal-Water Reactions
Plan for support of large-plant (post-CRBR) needs in large-leak sodium-water reaction area, 6:25523 (DOE/SF/70030—T19)
Technology Assessment
Impact of New Source Performance Standards on advanced industrial energy technology, 6:25604 (CONF-801210—25)
STEARATES
Phase Studies
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))
STEELS
See also AUSTENITIC STEELS
CARBON STEELS
CHROMIUM STEELS
Ductile-Brittle Transitions
Effect of strain-rate and microstructure on the ductile brittle transition temperature in structural steels: Part I. Literature assessment, 6:25910 (SAND—80-0732)
Fracture Properties
Effect of strain-rate and microstructure on the ductile brittle transition temperature in structural steels: Part I. Literature assessment, 6:25910 (SAND—80-0732)
Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)
Hydrogen Embrittlement
Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)
Shear Properties
Criterion for thermo-plastic shear instability, 6:25914 (SAND—81-0041C)
Tensile Properties
Criterion for thermo-plastic shear instability, 6:25914 (SAND—81-0041C)
Hydrogen compatibility of structural materials for energy storage and transmission. Final report, 6:25178 (SAND—81-8006)
STELLARATORS
See also TORSATRON STELLARATOR
Scaling Laws
Scaling studies in field reversal experiments, 6:26646
STIRLING ENGINES
Operation
Computer simulation of the transient response of a 4 cylinder Stirling engine with burner and air preheater in a vehicle (CNTLA, CNTLB, and WARM.FOR), 6:25875 (DOE/NASA/0226—1)
Performance
Computer simulation of the transient response of a 4 cylinder Stirling engine with burner and air preheater in a vehicle (CNTLA, CNTLB, and WARM.FOR), 6:25875 (DOE/NASA/0226—1)
Safety
System safety in Stirling engine development, 6:25876 (DOE/NASA/51040—25)

Technology Assessment
Overview: DOE/NASA automotive gas turbine and Stirling projects, 6:25865 (DOE/NASA/51040—28)
STORAGE DEVICES (DATA)
See MEMORY DEVICES
STORAGE (SPENT FUEL)
See SPENT FUEL STORAGE
STOVER
See AGRICULTURAL WASTES
STOVES
Air Pollution
Exposure to pollutants from domestic combustion sources: a preliminary assessment. Final report Aug 79-Feb 80, 6:26153 (PB—81-111536)
Energy Efficiency Standards
Minimum energy efficiency standards for ranges and ovens. Topical report, subtask 2.1, 6:25727 (SAI—026-79-858-LJ)
STRAIN GAGES
Calibration
Calibration of peizoresistive gauges, 6:26092 (UCRL—86285)
Temperature Effects
Transient temperature response of strain gages, 6:26088 (SAND—80-2689C)
STRATEGIC PETROLEUM RESERVE
Policy implications of energy vulnerability, 6:25634
STRATIFIED CHARGE ENGINES
Automotive Fuels
Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4))
Exhaust Gases
Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4))
Fuel Economy
Performance evaluation of a stratified-charge engine powered automobile, 6:25860 (DOE/BETC/IC—80/3(Vol.4))
STREAK PHOTOGRAPHY
Psuedo-3D, isodensity and density profiles from fiber optic output of a MACH-130 air shock, 6:26091 (UCRL—85655)
STREAMS
See also RIVERS
Acidification
Acid lakes and streams in the Galloway area, southwestern Scotland, 6:26264 (CONF-800365—)
Aluminum mobilization in acid stream environments, Great Smoky Mountains National Park, USA, 6:26251 (CONF-800365—)
Flow Models
Modelling sulfate concentrations in streamwater at Storgama, Southern Norway, 6:26278 (CONF-800365—)
PH Value
Effect of chemical weathering on surface waters, 6:26276 (CONF-800365—)
STRENGTH FUNCTIONS
Neutron strength functions: the link between resolved resonances and the optical model, 6:26601 (CONF-800979—18)
STRIPPER FOILS
See BEAM STRIPPERS
STRONG INTERACTIONS
See also HADRON-HADRON INTERACTIONS
Lattice Field Theory
Quark confinement, 6:26537
STRONTIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
STRONTIUM 79
Decay
Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$, 6:26583 (BNL—29658)
STRONTIUM 80
Energy Levels
Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$, 6:26583 (BNL—29658)
STRONTIUM 82
Isotope Production
^{82}Sr recovery from Mo irradiated for ^{77}Br production, 6:26007
STRONTIUM 88 TARGET
Deuteron Reactions
Collective and neutron-structure effects in the elastic scattering of vector polarized deuterons in the A = 90 mass region, 6:26584
STRONTIUM 90
Cherenkov Counting
Strontium-90 determinations by Cerenkov radiation counting for well monitoring at Oak Ridge National Laboratory, 6:25970 (ORNL/TM—7760)
STRONTIUM TITANATES
Catalytic Effects
Evidence for photodissociation of water vapor on reduced $SrTiO_3$ (111) surfaces in a high vacuum environment, 6:26000
STUDS
See FASTENERS
STYRENE POLYMERS
See POLYSTYRENE
SUBBITUMINOUS COAL
Chemical Reactions
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 6:24875
Comparative Evaluations
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 6:24875
Dissolution
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 6:24875
Oxidation
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
Pyrolysis
Investigation of yields and characteristics of tars released during the thermal decomposition of coal, 6:24880
Structural Chemical Analysis
Oxidative degradation studies and modern concepts of the formation and transformation of organic constituents of coals and sedimentary rocks, 6:24907
SUBCRITICAL ASSEMBLIES
Reactor Physics
Fast Breeder Blanket Facility (FBBF). Annual report, January 1, 1980-December 31, 1980 (Gamma heating; neutron spectra), 6:25497 (PNE—81-149)
SUBMARINES
High-temperature phase change thermal storage, 6:25766 (CONF-800272—)
SUCCINIC ACID
NMR Spectra
Novel method for controlled oxidation, 6:24908
SUGAR BEETS
Food Processing
Energy reduction in beet sugar processing by cossette liming, 6:25817
SUGAR CANE
Biothermohol Process
Hybrid biothermal conversion of biomass to liquid fuels, 6:25194
SULFATES
Adsorption
Effects of acid precipitation on soil and forest. 3. Sulfate sorption by acid forest soils, 6:26187 (CONF-800365—)
Aerosol Monitoring
Analytical techniques for ambient sulfate aerosols, 6:26111 (ANL—81-12)
Buildup
Modelling sulfate concentrations in streamwater at Storgama, Southern Norway, 6:26278 (CONF-800365—)
Deposition
Deposition of air pollutants in Norway, 6:26126 (CONF-800365—)
Sulfate at Birkenes, a small forested catchment in southernmost Norway, 6:26277 (CONF-800365—)

Environmental Transport
Regional issue identification and assessment program (RIIA) Issue paper 2. Atmospheric long-range transport lead laboratory methodology, 6:26114 (BNL—51289)
Sulfate dynamics in natural environments. Preliminary results from a case study (Norway), 6:26140 (CONF-800365—)
Infrared Spectra
Analytical techniques for ambient sulfate aerosols, 6:26111 (ANL—81-12)
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977
Monitoring
Snow pack storage and ion release, 6:26190 (CONF-800365—)

SULFIDES
Contamination
Technical assisTAnce report ta 80-33, Omaha waste pretreatment plant, omaha, Nebraska, 6:26150 (PB—81-111148)
Phase Studies
High-temperature Moessbauer study of ^{57}Fe interstitials in Chevrel phases, 6:25945 (CONF-800954—4)

SULFITES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977

SULFOCYANIDES
See THIOCYANATES

SULFONATES
Biodegradation
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))
Toxicity
Biodegradation of materials used in enhanced oil recovery, 6:24993 (DOE/BETC/IC—80/3(Vol.1))

SULFONES
Gas Chromatography
Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909
Mass Spectroscopy
Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909

SULFONIC ACID ESTERS
Rheology
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
Synthesis
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))
Viscosity
Synthesis, characterization and rheological behavior of model acrylamide random and graft copolymers for utilization in enhanced oil recovery, 6:25028 (DOE/BETC/IC—80/3(Vol.2))

SULFONIC ACIDS
Gas Chromatography
Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909
Mass Spectroscopy
Fate of sulfur functions on oxidation with peroxytrifluoroacetic acid, 6:24909

SULFUR
Deposition
Sulfur distribution and flux in two forested watersheds in eastern Tennessee, 6:26256 (CONF-800365—)
Electron Microprobe Analysis
Evaluation of the removal of organic sulfur from coal, 6:24866 (IS-M—317)
Environmental Effects
Acidification effect of urea and sulfur application on the forest soil in a percolation experiment, 6:26185 (CONF-800365—)
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)
Recovery
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))
Scavenging
Evaluation of a short-residence-time two-stage SRC process. Final report, 6:24861 (EPRI-AP—1827)
Solvent Extraction
Evaluation of the removal of organic sulfur from coal, 6:24866 (IS-M—317)
Sorption
Calcium-based sorbent desulfurization in pressurized fluidized-bed combustion power plants, 6:25445 (EPRI-CS—1847)

SULFUR COMPOUNDS
Chemical Analysis
Development of instrumental methods of analysis of sulfur compounds in coal-process streams: computer program manual for estimating concentrations of inorganic sulfur moieties from a thermodynamic data base. Quarterly technical progress report, January-March 1981, 6:24903 (DOE/ET/10482—T1)
Environmental Transport
Hydrogen, sulphur and nitrogen budgets in soils and catchments, 6:26275 (CONF-800365—)

SULFUR DIOXIDE
Biological Effects
Response of field-grown soybeans to acid precipitation alone and in combination with sulfur dioxide, 6:26346 (CONF-800365—)
Deposition
Deposition of air pollutants in Norway, 6:26126 (CONF-800365—)
Effects of acid precipitation on soil and forest. 2. Atmosphere-vegetation interactions, 6:26351 (CONF-800365—)
Soil acidification by SO_2 emissions in Alberta, Canada, 6:26141 (CONF-800365—)
Wind tunnel studies of dry deposition of SO_2 and H_2SO_4 aerosols, 6:26121 (CONF-800365—)
Ecological Concentration
Profile of air quality in Region V, 6:26171 (PB—81-116097)
Environmental Transport
Regional issue identification and assessment program (RIIA) Issue paper 2. Atmospheric long-range transport lead laboratory methodology, 6:26114 (BNL—51289)

SULFUR HYDRIDES
See HYDROGEN SULFIDES

SULFUR OXIDES
Removal
Chemically active fluid bed for SOX control. Volume I. process evaluation studies. Final report Jul 75-Oct 79, 6:24939 (PB—81-113946)

SULFURIC ACID
Biological Effects
Effects of artificial acidification with sulfuric acid on tree growth in Scots pine forest, 6:26349 (CONF-800365—)
Deposition
Wind tunnel studies of dry deposition of SO_2 and H_2SO_4 aerosols, 6:26121 (CONF-800365—)
Dew Point
CEGB experience with additive trials, 6:25063 (EPRI-WS—80-127)
Vapor Condensation
Summary of special discussion group on acid plumes and fallout, 6:25458 (EPRI-WS—80-127)

SUPERCONDUCTING CABLES
Research Programs
Semiannual report for the period April 1-September 30, 1980 of work on: (1) superconducting power transmission system development; and (2) cable insulation development, 6:25452 (BNL—51329)

SUPERCONDUCTING COILS
Design
Superconducting solenoid designed for 400 kJ at 25 kA under conditions of fast discharge and field reversal, 6:26695 (LA—8829-MS)
SUPERCONDUCTING FILMS
Penetration Depth
Effect of structural fluctuations on depth of penetration of longitudinal electric field into a superconducting film, 6:26619
SUPERCONDUCTING GENERATORS
Armatures
Demonstration of a helical armature for a superconducting generator, 6:25481
SUPERCONDUCTING MAGNETS
See also MAGNETIC ENERGY STORAGE
Safety
Safety of superconducting magnets for fusion: thermal and electromagnetic effects of rapid TF coil discharge, 6:26686 (CONF-801011—103)
Specifications
Six tesla analyzing magnet for heavy-ion beam transport, 6:26067 (CONF-800980—39)
SUPERCONDUCTORS
Cracks
Identification of quench origins in a superconductor with acoustic emission and voltage measurements, 6:26027
Quenching
Identification of quench origins in a superconductor with acoustic emission and voltage measurements, 6:26027
Switches
NbN materials development for practical superconducting devices, 6:26017 (CONF-800980—38)
SUPERCRITICAL FLOW
See TURBULENT FLOW
SUPERSYMMETRY
Electric Charges
Internal supersymmetry and unification, 6:26571
SUPPLY DISRUPTION
Government Policies
Policy implications of energy vulnerability, 6:25634
SURFACE MINING
See also COAL MINING
OIL SHALE MINING
Mining Equipment
Power shovel data accumulator and display, 6:24943 (DOE/PC/30205—T1)
SURFACE WATERS
See also LAKES
RIVERS
SEAS
STREAMS
WATER RESERVOIRS
Acidification
Sulfate at Birkenes, a small forested catchment in southernmost Norway, 6:26277 (CONF-800365—)
Geochemistry
Effect of chemical weathering on surface waters, 6:26276 (CONF-800365—)
PH Value
Evolution of acidity in surface waters of Laurentides Park (Quebec, Canada) over a period of 40 years, 6:26255 (CONF-800365—)
Importance of natural H^+ production for acidity in soil and water, 6:26260 (CONF-800365—)
Radionuclide Migration
Radionuclides in liquid effluents from Argonne National Laboratory: an example of monitoring for a multidisciplinary nuclear laboratory, 6:26292
Water Quality
Sulfate dynamics in natural environments. Preliminary results from a case study (Norway), 6:26140 (CONF-800365—)
SURFACE-ACTIVE AGENTS
See SURFACTANTS
SURFACTANTS
Effect of enhanced oil recovery chemicals on crude refining, 1979-1980, 6:25039 (DOE/BETC/IC—80/3(Vol.4))
Micellar-flood research: biopolymers, interfacial and phase behavior, and competitive adsorbates, 6:25020 (DOE/BETC/IC—80/3(Vol.2))
Adsorption
Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980, 6:25033 (DOE/BETC/OR—19)
Electrochemistry
Electrochemical analysis of surfactants for enhanced oil recovery, 6:24977 (DOE/BETC/IC—80/3(Vol.1))
Optimization
Optimum surfactant systems for oil recovery, 6:25030 (DOE/BETC/IC—80/3(Vol.2))
Surfactant optimization for DOE's field test: some unexpected phenomena, 6:25002 (DOE/BETC/IC—80/3(Vol.2))
Phase Studies
Dynamic interfacial properties and their effects on oil ganglia reconnection and displacement processes, 6:25024 (DOE/BETC/IC—80/3(Vol.2))
Optimum surfactant systems for oil recovery, 6:25030 (DOE/BETC/IC—80/3(Vol.2))
Studies of aqueous solutions and microemulsions for enhanced oil recovery processes, 6:25053 (DOE/BETC/IC—80/3(Vol.2))
Precipitation
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))
Solubility
Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980, 6:25033 (DOE/BETC/OR—19)
Synthesis
Surfactant synthesis, polymer buffer and surfactant slug design for the tertiary recovery of the Pennsylvania grade crude oil, 6:25021 (DOE/BETC/IC—80/3(Vol.2))
Toxicity
Toxicity of chemical compounds used in enhanced oil recovery, 6:25040 (DOE/BETC/IC—80/3(Vol.1))
SUSPENSIONS (FUEL)
See FUEL SLURRIES
SWAMPS
Acidification
Acidification of Belgian moorland pools by acid sulfur-rich rainwater, 6:26263 (CONF-800365—)
SWEDEN
Energy Demand
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
Resource Recovery Facilities
New generation - the Flakt recovery system, 6:25831 (ANL/CNSV-TM—60)
SWINE
Mass Rearing
Kelley Hot Spring Geothermal Project: Kelly Hot Spring Agricultural Center conceptual design, 6:25409 (GT—27041-4)
SWITCHES
NbN materials development for practical superconducting devices, 6:26017 (CONF-800980—38)
UV-laser-triggered switches, 6:26709 (SAND—81-0695C)
SWITCHING DIODES
Operation
Resonant mode PIN switch, 6:26053
SYNCHROTRON RADIATION
Uses
Research with x rays, 6:26093
SYNCHROTRON RADIATION SOURCES
Magnets
Wiggler and undulator magnets, 6:26073
SYNTHESIS GAS
Purification
Pipeline Gas Demonstration Plant: Phase I. Demonstration Plant Engineering and Design. Volume 6, Plant Section 400, Rectisol, 6:24844 (DOE/ET/13060—T3(Vol.6))
Synthesis
Conversion of forest residues to a clean gas for fuel or synthesis., 6:25190

SYNTHETIC FUELS
See also ALCOHOL FUELS
PYROLYTIC OILS
SYNTHETIC PETROLEUM
Biological Effects
Repository support of synfuels health effects research, 6:26388 (CONF-810562—1)
Financial Incentives
Synfuels challenges and opportunities, 6:24970
Planning
Synfuels challenges and opportunities, 6:24970
Research Programs
Special care needed in selecting projects for the Alternative Fuels Program, 6:25636 (EMD—81-36)
Stability
Fundamental synthetic fuel stability study, 6:24901 (DOE/BETC/IC—80/3(Vol.4))
Stability characteristics of hydrocarbon fuels from alternative sources, 6:24902 (DOE/BETC/IC—80/3(Vol.4))
Storage
Fundamental synthetic fuel stability study, 6:24901 (DOE/BETC/IC—80/3(Vol.4))
SYNTHETIC FUELS INDUSTRY
Occupational Safety
Luminescence monitoring of oil or tar contamination for industrial hygiene, 6:26095
SYNTHETIC PETROLEUM
Chemical Composition
Characterization of fossil liquids, 6:25056 (DOE/BETC/IC—80/3(Vol.4))
Stability
Stability characteristics of hydrocarbon fuels from alternative sources, 6:24902 (DOE/BETC/IC—80/3(Vol.4))

T

TANDEM ELECTROSTATIC ACCELERATORS
Beam Optics
Argonne tandem as injector to a superconducting linac, 6:26064 (CONF-8006123—3)
Beam Strippers
Carbon stripper foils for heavy-ion accelerators, 6:26069 (CONF-801111—46)
TANKS
Inspection
Electrical and electronic subsystems of a nuclear waste tank annulus inspection system, 6:25141 (RHO-SA—221)
TANTALUM 181 TARGET
Pion Reactions
Inclusive reactions of pions on nuclei, 6:26575
TANTALUM BORIDES
Chemical Vapor Deposition
Low temperature chemical vapor deposition of TaB_2 (773 to 1200K), 6:25939
TANTALUM OXIDES
Phase Transformations
Raman scattering studies of the impurity-induced ferroelectric phase transition in $KTaO_3$:Li, 6:25958
TAR
See also BITUMENS
COAL TAR
Photoluminescence
Luminescence monitoring of oil or tar contamination for industrial hygiene, 6:26095
TAR SANDS
See OIL SANDS
TATB
(1,3,5-Triamino-2,4,6-trinitrobenzene.)
Distribution
Study for compacting the explosive LX-17, 6:26097 (MHSMP—81-28)
TAU LEPTONS
See TAU PARTICLES
TAU PARTICLES
Pair Production
Measurement of the decays tau$^-$→rho$^-$ ν/sub tau/ and tau$^-$→K$^-$(892)ν/sub tau/ using the Mark II detector at spear, 6:26506
Semileptonic Decay
Measurement of the decays tau$^-$→rho$^-$ ν/sub tau/ and tau$^-$→K$^-$(892)ν/sub tau/ using the Mark II detector at spear, 6:26506
TAUONS
See TAU PARTICLES
TAXICABS
Subsidies
User-side subsidies for shared-ride taxis in Kinston, North Carolina. Final report, 6:25756 (UMTA-NC—06-0002-80-1)
TBP
(Tributyl phosphate.)
Combustion
Process verification testing for burning TBP-containing organic solvents in the NWCF, 6:25125 (ENICO—1086)
TEARING INSTABILITY
Nonlinear analysis of disruptions in the JIPP T-II tokamak, 6:26637 (ORNL/TM—7733)
TECHNETIUM 94
High Spin States
Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near N~50, 6:26587
Yrast States
Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near N~50, 6:26587
TECHNOLOGY TRANSFER
See also COMMERCIALIZATION
Multimarket, multitechnology, multiattribute technological forecasting, 6:25611
International Agreements
Foreign travel report, 6:25323 (CONF-790203—)
International Cooperation
Foreign travel report, 6:25323 (CONF-790203—)
TELEVISION
Energy Efficiency Standards
Background document for the advanced notice of proposed rulemaking for dishwashers, television sets, clothes washers, humidifiers and dehumidifiers. Topical report subtask 1.1: consumers products minimum energy efficiency standards program, 6:25726 (SAI—026-79-855-LJ)
TELLURIUM
Absorption Spectra
Photoionization of atomic iodine and atomic tellurium, 6:26467
Photoionization
Photoionization of atomic iodine and atomic tellurium, 6:26467
Photoionization of atomic iodine and atomic tellurium, 6:26447 (CONF-800626—8)
TELLURIUM 122
Giant Resonance
Observation of giant dipole resonances built on states of high energy and spin, 6:26588
TEMPERATURE MEASUREMENT
Optical Equipment
Measurement of peak temperature along an optical fiber, 6:26087 (DOE/TIC—1023186)
TENNESSEE
Emergency Plans
An evaluation of air pollution abatement relaxation strategies for Tennessee during periods of pending or actual energy emergencies. (Tennessee State science, engineering, and technology project). Final report, 6:25605 (PB—81-114605)
Wind Power
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)
TERPHENYLS
Fouling
Measuring and controlling the fouling film formation of HB-40 organic coolant, 6:25487
TERRESTRIAL ECOSYSTEMS
See also SWAMPS
Microcosms
Chemical evaluation: projected application of terrestrial microcosm technology, 6:26179

Fate and behavior of pesticides in a compartmentalized microcosm, 6:26193
Microcosm evaluation of the agricultural potential of fly-ash-amended soils, 6:26203
Microcosms in ecological research, 6:26212
Terrestrial microcosms: what questions do they address, 6:26178

TEST FACILITIES
Design
Calibrated/guarded hot-box test facility, 6:25753
New high-temperature guarded hot-box facility for reflective insulation, 6:25761
Sandia shock thermodynamics applied research facility, 6:26047 (SAND—81-1528C)
Quality Assurance
Development of a quality-assurance program for the Tritium Systems Test Assembly, 6:26697 (LA-UR—81-1416)
Thermocouples
Analysis of thermal conductivity probes for high temperature applications, 6:25537 (SAND—81-0106)

TETRAHYDRONAPHTHALENE
See TETRALIN

TETRALIN
Chemical Reactions
Coal structure cleavage mechanisms: scission of diphenylmethane and diphenyl ether linkages to hydroxylated rings, 6:24916
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 6:24875
Comparative Evaluations
Evaluation of the donor ability of coal liquefaction solvents, 6:24874
Oxidation
HPLC and phase transfer catalysis in the analysis of oxidation products of lignite liquids and model compounds (Oxidizing agents: trifluoroperacetic acid, ruthenium tetraoxide, ceric ammonium nitrate, potassium permanganate), 6:24912

TEXAS
Earth-Covered Buildings
Thin shell roof systems and construction techniques for earth sheltered housing, 6:25746
Energy Models
Energy modeling. Volume II. Inventory and details of state energy models (Book), 6:25592 (DOE/CS/10046—2(Vol.2))
Geological Surveys
Bureau of Economic Geology 1980 annual report (Monograph), 6:25609
Research Programs
Bureau of Economic Geology 1980 annual report (Monograph), 6:25609

TEXTILE INDUSTRY
Energy Efficiency
Wet processing of textiles using foams, 6:25771 (CONF-800272—)

TEXTILES
Dyes
Environmental readiness document: industrial programs, FY 1980, 6:26303 (DOE/ERD—0031)
Processing
Wet processing of textiles using foams, 6:25771 (CONF-800272—)

TFTR REACTORS
Breeding Blankets
Annual report, October 1, 1979-September 30, 1980, 6:26643 (PPPL-Q—38)
Neutron Detection
Microchannel plate response to high-energy neutrons, 6:26638 (PPPL—1773)
Research Programs
Annual report, October 1, 1979-September 30, 1980, 6:26643 (PPPL-Q—38)

THERMAL DECOMPOSITION
See PYROLYSIS

THERMAL DIFFUSIVITY
Measuring Methods
Improved data-reduction methods for laser-pulse-diffusivity determination with the use of minicomputers, 6:26724 (SAND—80-2602C)
Method for fast pulsed thermal diffusivity measurements in thin films, 6:26614 (SAND—80-2694C)

THERMAL EFFLUENTS
Biological Effects
Ecological investigations at power plant cooling lakes, reservoirs, and ponds: an annotated bibliography. Final report, 6:26324 (EPRI-EA—1874)
Literature review: response of fish to thermal discharges. Final report, 6:26323 (EPRI-EA—1840)

THERMAL ENERGY STORAGE EQUIPMENT
Design
Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant, 6:25308 (SAND—80-8190)
Thermal-storage-subsystem analysis report (RADL Item 5-1), 6:25298 (DOE/SF/10499—T29)
Mathematical Models
Extended development of a sodium hydroxide thermal-energy storage module, 6:25579 (DOE/NASA/0138—1)
Performance
Extended development of a sodium hydroxide thermal-energy storage module, 6:25579 (DOE/NASA/0138—1)
Research Programs
Thermal energy storage for solar thermal applications program. Progress report, April 1980-March 1981, 6:25580 (SAND—81-8225)

THERMAL INSULATION
See also MINERAL WOOL
Materials Testing
Reference materials for insulation measurement comparisons, 6:25678
Meetings
Thermal transmission measurements of insulation, 6:25677
Natural Convection
Natural convective heat transfer in permeable insulation, 6:25750
Performance Testing
Heat transfer in refractory fiber insulations, 6:25760
New high-temperature guarded hot-box facility for reflective insulation, 6:25761
Standards
Does the insulation have a thermal conductivity. The revised ASTM test standards require an answer, 6:25749
Reference materials for insulation measurement comparisons, 6:25678
Thermal Conductivity
Analysis of the applicability of the hot-wire technique for determination of the thermal conductivity of diathermanous materials, 6:25683
Calibrated/guarded hot-box test facility, 6:25753
Determination of the thermal conductivity of refractory insulating materials by the hot-wire method (Temperatures to 1000°C), 6:25686
Does the insulation have a thermal conductivity. The revised ASTM test standards require an answer, 6:25749
Fibrous insulating materials as standard reference materials at low temperatures, 6:25679
Heat transfer in refractory fiber insulations, 6:25760
Thermal conductivity measurements on high-temperature fibrous insulations by the hot-wire method (25 to 1600°C), 6:25684
Thermal transmission measurements of insulation, 6:25677

THERMAL POLLUTION
(Environmental temperature rise due to waste heat disposal)
Bibliographies
Ecological investigations at power plant cooling lakes, reservoirs, and ponds: an annotated bibliography. Final report, 6:26324 (EPRI-EA—1874)

Biological Effects
Effects of temperature on periphyton biomass and community composition in the Browns Ferry experimental channels, 6:26328
Effects of elevated temperatures on macroinvertebrate populations in the Browns Ferry experimental ecosystems, 6:26329
Environmental Effects
Effects of thermal additions on the presence of pathogenic and nonpathogenic free-living amoebae at the Savannah River Laboratory, 6:26294 (DP-MS—81-64)
Mathematical Models
Modeling of heated surface jets. Final technical report, 6:26295 (PB—81-116857)

THERMAL POWER PLANTS
See also COMBINED-CYCLE POWER PLANTS
FOSSIL-FUEL POWER PLANTS
GEOTHERMAL POWER PLANTS
NUCLEAR POWER PLANTS
REFUSE-FUELED POWER PLANTS
WOOD-FUEL POWER PLANTS
Chemical Effluents
Development document for proposed effluent limitations guidelines, new source performance standards, and pretreatment standards for the steam electric point source category. Interim report, 6:25469 (PB—81-119075)
Cooling Towers
Environmental assessment of cooling tower drift and vapor emissions for the proposed Vienna Unit No. 9, 6:25450 (PB—81-119737)
Environmental Effects
Literature review: response of fish to thermal discharges. Final report, 6:26323 (EPRI-EA—1840)
Environmental Impacts
Assessment of the impacts of water intakes on alewife, rainbow smelt, and yellow perch populations in Lake Michigan, 6:26296 (ANL/ES—109)
Intake Structures
Assessment of the impacts of water intakes on alewife, rainbow smelt, and yellow perch populations in Lake Michigan, 6:26296 (ANL/ES—109)
Cooling water intake screening devices used to reduce entrainment and impingement. Topical briefs: fish and wildlife resources and electric power generation, No. 9, 6:25468 (PB—81-116055)
Pollution Regulations
Development document for proposed effluent limitations guidelines, new source performance standards, and pretreatment standards for the steam electric point source category. Interim report, 6:25469 (PB—81-119075)

THERMAL STORAGE
See HEAT STORAGE

THERMAL WATERS
Desulfurization
Geothermal hydrogen sulfide removal, 6:25394 (DOE/ET/27203—1)

THERMIONIC CONVERTERS
Materials Testing
DOE/JPL Advanced Thermionic Technology Program. Progress report No. 44, July-August-September 1980, 6:25659 (DOE/ET/11292—T4)
DOE/JPL Advanced Thermionic Technology Program. Progress report No. 45, October-November-December 1980, 6:25660 (DOE/ET/11292—T5)
Performance Testing
DOE/JPL Advanced Thermionic Technology Program. Progress report No. 44, July-August-September 1980, 6:25659 (DOE/ET/11292—T4)
DOE/JPL Advanced Thermionic Technology Program. Progress report No. 45, October-November-December 1980, 6:25660 (DOE/ET/11292—T5)

THERMOCHEMICAL PROCESSES
Economics
Preliminary economic overview of large-scale thermal conversion system using wood feedstocks, 6:25291
Technology Assessment
Preliminary economic overview of large-scale thermal conversion system using wood feedstocks, 6:25291

THERMOCOUPLES
Analysis of thermal conductivity probes for high temperature applications, 6:25537 (SAND—81-0106)

THERMOELECTRIC GENERATORS
Design
Thermoelectric energy converter for generation of electricity from low-grade heat (Patent), 6:25658
Performance
Progress report No. 29 for a program of thermoelectric generator testing and RTG degradation mechanisms evaluation, 6:25657 (DOE/ET/33003—T2)

THERMONUCLEAR FUELS
Meetings
Alternate fusion fuels workshop, 6:26687 (CONF-810141—(Absts))

THERMONUCLEAR POWER PLANTS
Design
Inertial-confinement fusion central-station electric-power-generating plant. Final report, March 1, 1979-September 30, 1980, 6:26690 (DOE/DP/40086—1(Vol.1))
Inertial-confinement fusion central-station electric-power-generating plant. Final report, March 1, 1979-September 30, 1980, 6:26691 (DOE/DP/40086—1(Vol.2))

THERMONUCLEAR REACTOR COOLING SYSTEMS
Choice of coolant in commercial tokamak power plants, 6:26672 (CONF-801011—87)

THERMONUCLEAR REACTOR MATERIALS
Data Compilation
FLUNG: coupled 35-group neutron and 21-group gamma ray, P_3 cross sections for fusion applications, 6:26702 (ORNL/TM—7828)
Materials Testing
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)
Research Programs
Special Purpose Materials annual progress report, October 1, 1979, 6:25902 (DOE/ER—0048/1)

THERMONUCLEAR REACTORS
(For use in cases where certain aspects of either hypothetical or real thermonuclear reactors are discussed.)
See also DOUBLET REACTORS
E-BEAM TYPE REACTORS
I-BEAM TYPE REACTORS
TFTR REACTORS
TOKAMAK TYPE REACTORS
Plasma Confinement
Magnetic confinement of fusion plasmas, 6:26664

THERMONUCLEAR WEAPONS
See NUCLEAR WEAPONS

THERMOPLASTICS
Radiation Effects
Influence of Co-60 γ-ray on the stress relaxation of SBS type thermoplastic elastomer, 6:25943

THETA PINCH
Magnetohydrodynamics
Long-wavelength magnetohydrodynamic stability of the field reversed theta pinch, 6:26661
Plasma Macroinstabilities
Finite Larmor radius theory of resistive instabilities, 6:26650

THIO COMPOUNDS
See ORGANIC SULFUR COMPOUNDS

THIOCYANATES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977

THIOETHERS
See SULFIDES

THIOPHENOLS
Desulfurization
Chemical studies of the Ames oxydesulfurization process, 6:24911

THIOSULFATES
Ion Exchange Chromatography
Anion chromatography with low-conductivity eluents. II, 6:25977

THORIUM
Activation Analysis
Determination of uranium and thorium in semiconductor memory materials by high fluence neutron activation analysis, 6:25965 (CONF-810682—3)
Mass Transfer
Microcracks and energy. Progress report, April 1, 1980-February 28, 1981, 6:25089 (DOE/ER/04972—1)
Permeability
Neutron-scattering study of hydrogen diffusion in thorium, 6:25930
X-Ray Fluorescence Analysis
Determination of ultratrace concentrations of uranium and thorium in natural waters by x-ray fluorescence, 6:25964 (CONF-810647—6)
THORIUM 230
Environmental Exposure Pathway
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
Radioecological Concentration
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
THORIUM 232 TARGET
Neutron Reactions
Evaluation of ^{232}Th for ENDF/B-V, 6:26595 (BNL-NCS—51360)
THREE MILE ISLAND-2 REACTOR
Decontamination
GEND planning report, 6:25525 (GEND—001)
Three Mile Island Unit 2: decontamination program, 6:25544
Emergency Plans
Commonwealth of Pennsylvania emergency preparedness and response: the Three Mile Island incident, 6:25566
Environmental Impacts
Health impact of the Three Mile Island accident, 6:25506
Meetings
Three Mile Island nuclear accident: lessons and implications, 6:25539
Personnel
Behavioral and mental health effects of the Three Mile Island accident on nuclear workers: a preliminary report, 6:25551
Public Information
Representing public interest groups, 6:25550
Public Opinion
Accident at Three Mile Island and the problem of uncertainty, 6:25563
Local public opinion, 6:25552
Pregnant pause: the European response to the Three Mile Island accident, 6:25555
Public interest groups, 6:25561
Reaction of the regulatory agency as viewed from the perspective of the public interest organization, 6:25562
Stress in the community: a report to the President's Commission on the Accident at Three Mile Island, 6:25553
Three Mile Island: a resident's perspective, 6:25554
Three Mile Island and the scientific community, 6:25558
Radioactive Effluents
Health impact of the Three Mile Island accident, 6:25506
Three Mile Island: assessment of radiation exposures and environmental contamination, 6:25505
Reactor Accidents
Accident at Three Mile Island and the problem of uncertainty, 6:25563
Behavioral and mental health effects of the Three Mile Island accident on nuclear workers: a preliminary report, 6:25551
Commonwealth of Pennsylvania emergency preparedness and response: the Three Mile Island incident, 6:25566
Health impact of the Three Mile Island accident, 6:25506
Investigations of reported plant and animal health effects in the Three Mile Island area. Regulatory report, 6:25533 (NUREG—0738)
Lessons of Three Mile Island for the institutional management and regulation of nuclear power, 6:25565
Local public opinion, 6:25552
Pregnant pause: the European response to the Three Mile Island accident, 6:25555
Public interest groups, 6:25561
Reaction of Congress to the accident at Three Mile Island, 6:25557
Reaction of the nuclear industry to the Three Mile Island accident, 6:25559
Reaction of the regulatory agency as viewed from the perspective of the public interest organization, 6:25562
Reassessing the nuclear option: Three Mile Island from a state perspective, 6:25560
Representing the Nuclear Regulatory Commission, 6:25547
Representing the congress, 6:25548
Representing public interest groups, 6:25550
Stress in the community: a report to the President's Commission on the Accident at Three Mile Island, 6:25553
Technical aspects and chronology of the Three Mile Island accident, 6:25543
Three Mile Island nuclear accident: lessons and implications, 6:25539
Three Mile Island: assessment of radiation exposures and environmental contamination, 6:25505
Three Mile Island Unit 2: decontamination program, 6:25544
Three Mile Island: a resident's perspective, 6:25554
Three Mile Island and the scientific community, 6:25558
Three Mile Island nuclear accident: the other lesson, 6:25564
What the president's commission learned about the media, 6:25545
TIME-OF-USE PRICING
Economic Impact
Socioeconomic impacts of time-of-day pricing by electric utilities: a case study of Philadelphia residential customers, 6:25637 (BNL—51326)
Social Impact
Socioeconomic impacts of time-of-day pricing by electric utilities: a case study of Philadelphia residential customers, 6:25637 (BNL—51326)
TIN 124 TARGET
Argon 40 Reactions
Observation of giant dipole resonances built on states of high energy and spin, 6:26588
TIN ALLOYS
Chemical Analysis
Chemical makeup of Nb and Nb_3Sn films, 6:25983 (SAND—81-0969C)
Fracture Properties
Development of fracture toughness measurement capability by ultrasound. Final report, 6:26044 (BDX—613-2625)
Phase Studies
High-temperature Moessbauer study of ^{57}Fe interstitials in Chevrel phases, 6:25945 (CONF-800954—4)
TIN SULFIDES
Electric Conductivity
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Electronic Structure
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
Superconductivity
Normal-state electronic properties of $Sn_{0.12}Eu_{1.08}Mo_6S_8$ at low temperature and high pressure, 6:25951 (LA-UR—81-1044)
TIPVANE ROTORS
Aerodynamics
Advanced and innovative wind energy concept development: dynamic inducer system. Executive summary, 6:25427 (SERI/TR—8085-1-T1)
Advanced and innovative wind energy energy concept development: dynamic inducer system. Research report, 6:25428 (SERI/TR—8085-1-T2)
Performance Testing
Advanced and innovative wind energy concept development: dynamic inducer system. Executive summary, 6:25427 (SERI/TR—8085-1-T1)
Advanced and innovative wind energy energy concept development: dynamic inducer system. Research report, 6:25428 (SERI/TR—8085-1-T2)
TISSUES
See also PLANT TISSUES

Radioassay
Animal Investigation Program: Nevada Test Site and Vicinity. Annual report, 1979, 6:26196 (DOE/DP/00539—042)

TITANATES
Magnetization
Muon states in the antiferromagnetic oxides α-Fe_2O_3 and $FeTiO_3$, 6:25950 (LA-UR—81-1017)

TITANIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Preliminary characterization of catalysts tested in the H-coal bench unit, 6:24883
Sorptive Properties
Chemisorption theory: Dissociation of H_2 on Ti(0001), 6:25927

TITANIUM ALLOYS
See also TITANIUM BASE ALLOYS
Fracture Properties
Development of fracture toughness measurement capability by ultrasound. Final report, 6:26044 (BDX—613-2625)
Mechanical Properties
Effect of titanium content and aging temperature on the properties of uranium-titanium alloys, 6:25916 (Y/DV—73)
Microstructure
Effect of titanium content and aging temperature on the properties of uranium-titanium alloys, 6:25916 (Y/DV—73)
Tensile Properties
Hydrogen content and strain rate effects on the tensile properties of a uranium-titanium alloy, 6:25917 (Y/DV—74)

TITANIUM BASE ALLOYS
Cracks
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)

TITANIUM BORIDES
Chemical Vapor Deposition
Chemical vapor deposition of TiB_2 from diborane (600 to 900°C), 6:25938

TITANIUM CARBIDES
Catalytic Effects
Non-noble catalysts and catalyst supports for phosphoric-acid fuel cells. 2nd quarterly report, December 1980-February 1981, 6:25668 (DOE/NASA/6229—2)

TITANIUM HYDRIDES
Nuclear Magnetic Resonance
Nuclear magnetic resonance studies of hydrogen in TiCrsub(1.8)Hsub(x), 6:25936

TITANIUM OXIDES
Catalytic Effects
Catalytic activity of shock-loaded TiO_2 powder, 6:25984 (SAND—81-1352C)
Crystal Defects
Paramagnetic defects in shock-loaded TiO_2, 6:25937 (SAND—80-0019C)
Crystal-Phase Transformations
Paramagnetic defects in shock-loaded TiO_2, 6:25937 (SAND—80-0019C)
Electron Spin Resonance
Catalytic activity of shock-loaded TiO_2 powder, 6:25984 (SAND—81-1352C)
Materials Recovery
Advanced research and technology, direct utilization: recovery of minerals from coal fly ash. Fossil energy program. Technical progress report, 1 October 1980-31 December 1980, 6:24929 (IS—4773)

TMX DEVICES
Distribution Functions
Electron-cyclotron-resonant-heated electron distribution functions, 6:26645 (UCRL—85826)

TOBACCO SMOKES
Indoor Air Pollution
Ventilation requirements for control of occupancy odor and tobacco smoke odor: laboratory studies. Final report, 6:26400 (LBL—12589)

TOKAMAK DEVICES
See also SPHEROMAK DEVICES
TORMAC DEVICES
Charged-Particle Transport
Confinement of high energy trapped particles in tokamaks, 6:26641 (PPPL—1789)
Drift Instability
Collisional drift waves in a plasma with electron temperature inhomogeneity, 6:26648
Entropy
Tokamak microturbulence and the second law of thermodynamics, 6:26659
Fluctuations
Tokamak microturbulence and the second law of thermodynamics, 6:26659
Plasma Confinement
Confinement of high energy trapped particles in tokamaks, 6:26641 (PPPL—1789)
Tearing Instability
Nonlinear analysis of disruptions in the JIPP T-II tokamak, 6:26637 (ORNL/TM—7733)
Turbulence
Tokamak microturbulence and the second law of thermodynamics, 6:26659

TOKAMAK ETF
Radiation Hazards
Tritium-handling considerations for ETF and STARFIRE, 6:26673 (CONF-801011—88)

TOKAMAK TYPE REACTORS
See also DOUBLET REACTORS
INTOR TOKAMAK
STARFIRE TOKAMAK
TFTR REACTORS
TOKAMAK ETF
Beta Ratio
Ideal MHD beta-limits of poloidally asymmetric equilibria, 6:26639 (PPPL—1787)
Breeding Blankets
Development of tritium breeding blankets for DT-burning fusion reactors, 6:26677 (CONF-801011—92)
Electromagnetic effects involving a tokamak reactor first wall and blanket, 6:26676 (CONF-801011—91)
First-wall, blanket, and shield engineering test program for magnetically confined fusion power reactors, 6:26684 (CONF-801011—100)
Design
Implications of the DD fuel cycle on tokamak reactor technology considerations, 6:26678 (CONF-801011—93)
Initial trade and design studies for the fusion engineering device, 6:26700 (ORNL/TM—7777)
First Wall
Electromagnetic effects involving a tokamak reactor first wall and blanket, 6:26676 (CONF-801011—91)
First-wall, blanket, and shield engineering test program for magnetically confined fusion power reactors, 6:26684 (CONF-801011—100)
Fuel Cycle
Alternate fusion fuels workshop, 6:26687 (CONF-810141—(Absts))
High-Frequency Heating
Internal resistive initiation coil electromagnetics in the FED/INTOR baseline design, 6:26633 (LA—8784-MS)
Magnet Coils
Resistive demountable toroidal-field coils for tokamak reactors, 6:26705 (PPPL—1809)
Maintenance
In-situ maintenance of low-Z limiters in reactors, 6:26683 (CONF-801011—99)
Planning
Initial trade and design studies for the fusion engineering device, 6:26700 (ORNL/TM—7777)
Plasma Macroinstabilities
Ideal MHD beta-limits of poloidally asymmetric equilibria, 6:26639 (PPPL—1787)

Reviews
Status of the tokamak program, 6:26701 (ORNL/TM—7778)
Shielding
First-wall, blanket, and shield engineering test program for magnetically confined fusion power reactors, 6:26684 (CONF-801011—100)
Superconducting Magnets
Safety of superconducting magnets for fusion: thermal and electromagnetic effects of rapid TF coil discharge, 6:26686 (CONF-801011—103)
Thermonuclear Fuels
Alternate fusion fuels workshop, 6:26687 (CONF-810141—(Absts))

TOLERANCE
Genetic Variability
Genetic variation in acid tolerance in brown trout, 6:26368 (CONF-800365—)

TOLUENE
Phase Studies
Ion exchange characteristics of enhanced oil recovery systems (miscibility studies). Sesquiannual report, April 1, 1979-September 30, 1980, 6:25033 (DOE/BETC/OR—19)

TORMAC DEVICES
Magnetic Fields
Anomalous toroidal field penetration in Tormac V, 6:26658

TORSATRON STELLARATOR
Beta Ratio
Beta limits for torsatrons, 6:26666

TOTAL ENERGY SYSTEMS
Energy Storage
Storage in residential solar total-energy systems, 6:25389 (BNL—51230)
Feasibility Studies
Combined generation of electricity and heat in the dairy industry, 6:25803

TOWER FOCUS POWER PLANTS
See also BARSTOW SOLAR PILOT PLANT
Hazards
Hazard analysis for 10 MW/sub e/ solar thermal central receiver pilot plant. Supplement 1. Final report, 6:25303 (MCR—78-1331A)
Thermal Energy Storage Equipment
Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant, 6:25308 (SAND—80-8190)

TOXIC MATERIALS
Biological Accumulation
Large-scale microcosms for assessing fates and effects of trace contaminants, 6:26221
Biological Effects
Toxic organic compounds from energy production, 6:26146 (DOE/EV/10449—T1)
Chemical Analysis
Toxic organic compounds from energy production, 6:26146 (DOE/EV/10449—T1)
Environmental Transport
Toxic organic compounds from energy production, 6:26146 (DOE/EV/10449—T1)

TRACHEA
Transplants
Characterization of mucin isolated from rat tracheal transplants, 6:26304

TRANSFER (HEAT)
See HEAT TRANSFER

TRANSFER (MASS)
See MASS TRANSFER

TRANSFORMERS
Availability
Study to improve transmission system availability and utilization through identification of critical parameters and transformer performance analysis. Final technical report, 6:25472 (DOE/ET/29356—6)
Data Acquisition Systems
Study to improve transmission system availability and utilization through identification of critical parameters and transformer performance analysis. Final technical report, 6:25472 (DOE/ET/29356—6)
Performance
Study to improve transmission system availability and utilization through identification of critical parameters and transformer performance analysis. Final technical report, 6:25472 (DOE/ET/29356—6)

TRANSMISSION LINES
See POWER TRANSMISSION LINES

TRANSPORT THEORY
Analytical Solution
Linear transport in nonhomogeneous media., 6:26611

TRANSPORTATION SECTOR
Subsidies
User-side subsidies for shared-ride taxis in Kinston, North Carolina. Final report, 6:25756 (UMTA-NC—06-0002-80-1)

TREES
See also PINES
Plant Growth
Acid precipitation, plant nutrients and forest growth, 6:26337 (CONF-800365—)
Effects of acid precipitation on soil and forest. 9. Tree growth in field experiments, 6:26356 (CONF-800365—)
Sensitivity
Effects of acid precipitation on soil and forest. 2. Atmosphere-vegetation interactions, 6:26351 (CONF-800365—)
Reconstruction of species composition of stands as a necessary condition for the survival of the Niepolomice Forest (Poland), 6:26344 (CONF-800365—)

TRIBUTYL PHOSPHATE
See TBP

TRIGGER CIRCUITS
Microprocessors
Use of the ECL-CAMAC trigger processor system for recoil missing mass triggers at the Tagged Photon Spectrometer at Fermilab, 6:26077 (FERMILAB-Conf—81/40-EXP)

TRIPLET PARTICLES
See QUARKS

TRITICUM
See WHEAT

TRITIUM
Tritium-handling considerations for ETF and STARFIRE, 6:26673 (CONF-801011—88)
Radioactivity
Environmental monitoring at Ames Laboratory: calendar year 1980, 6:26167 (IS—4768)
Test Facilities
Development of a quality-assurance program for the Tritium Systems Test Assembly, 6:26697 (LA-UR—81-1416)

TRITIUM COMPOUNDS
Scintillation Counting
Simple and effective method for measurement of HTO and HT in environmental air, 6:25975

TRITIUM RECOVERY
Analysis of in-situ tritium recovery from solid fusion-reactor blankets, 6:26675 (CONF-801011—90)

TRITON REACTIONS
Pickup Reactions
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594
Spectroscopy and mass measurements of neutron rich isotopes by the (t,α) reaction, 6:26590 (LA-UR—81-1721)
Stripping
Dynamical supersymmetries and single-particle strengths in iridium nuclei, 6:26594

TROUT
Animal Growth
Growth and survival of fingerlings in acidic water, 6:26369 (CONF-800365—)
Biological Stress
Acid stress in trout from a dilute mountain stream, 6:26372 (CONF-800365—)
Physiology
Physiology of fish in acid waters, 6:26360 (CONF-800365—)
Population Dynamics
Acid stress in trout from a dilute mountain stream, 6:26372 (CONF-800365—)

Acidification: effects on freshwater fish, 6:26339 (CONF-800365—)
Aluminum mobilization in acid stream environments, Great Smoky Mountains National Park, USA, 6:26251 (CONF-800365—)
Sensitivity
Physiological responses to acid water in fish. 1. Effects from changes in plasma osmolality and ion concentration on heart ventricle water content and intracellular concentrations of K^+ and taurine in the brown trout (Salmo trutta L.), 6:26383 (CONF-800365—)
Toxic effects of aluminum on the brown trout, Salmo trutta L., 6:26373 (CONF-800365—)
Survival Time
Growth and survival of fingerlings in acidic water, 6:26369 (CONF-800365—)
Tolerance
Genetic variation in acid tolerance in brown trout, 6:26368 (CONF-800365—)
Physiological responses to acid water in fish. 2. Effects of acid water on metabolism and gill ventilation in brown trout, Salmo trutta L., and brook trout, Salvelinus fontinalis Mitchill, 6:26384 (CONF-800365—)

TRUCKS
Automotive Fuels
Gasohol: laboratory and fleet test evaluation, 6:25885 (DOE/BETC/IC—80/3(Vol.4))
Exhaust Gases
Gasohol: laboratory and fleet test evaluation, 6:25885 (DOE/BETC/IC—80/3(Vol.4))
Technical feasibility of the proposed 1982-1983 high altitude standards for light duty vehicles and light duty trucks. Technical report, 6:25873 (PB—81-118630)
Fuel Consumption
The effect of economic regulation on fuel-use efficiency in private trucking operations. Final report, 6:25755 (PB—81-114753)
Fuel Economy
Gasohol: laboratory and fleet test evaluation, 6:25885 (DOE/BETC/IC—80/3(Vol.4))
Surface Coating
Automobile and light-duty truck surface coating operations-background information for promulgated standards. Final report, 6:26156 (PB—81-113920)

TUBES (CONDUITS)
See PIPES

TUFF
Hydrodynamics
TOODY-WONDY calculations of penetration events, 6:26062 (SAND—81-0050C)
Radionuclide Migration
Nevada Nuclear Waste Storage Investigations. Radionuclide migration in tuff and granite: peer review documentation, 6:25128 (NVO—196-23)

TUMOR CELLS
Chromosomal Aberrations
Cytogenetic evidence for recurrence of acute myelogenous leukemia after allogeneic bone marrow transplantation in donor hematopoietic cells, 6:26312
Enzyme Activity
Human T-cell lymphoma with suppressor effects on the mixed lymphocyte reaction (MLR). I. Morphological and cytogenetic analysis, 6:26305
Morphology
Human T-cell lymphoma with suppressor effects on the mixed lymphocyte reaction (MLR). I. Morphological and cytogenetic analysis, 6:26305

TUMORS
See NEOPLASMS

TUNGSTEN
Coatings
W-Re composite tube fabricated by chemical vapor deposition for application in an 1800°C high thermal efficiency fuel-processing furnace, 6:25908
Neutron Transport
Neutron-photon multigroup cross sections for neutron energies ≦ 400 MeV, 6:26610 (ORNL/TM—7818)

TUNGSTEN CARBIDES
Catalytic Effects
Non-noble catalysts and catalyst supports for phosphoric-acid fuel cells. 2nd quarterly report, December 1980-February 1981, 6:25668 (DOE/NASA/6229—2)

TUNNELS
Electromagnetic Surveys
Detection of water-filled and air-filled underground cavities, 6:26420 (UCRL—53127)

TURBINE PUMPS
See PUMP TURBINES

TURBULENT FLOW
Numerical Solution
Time dependent Navier-Stokes solution of a turbulent gas jet ejected from a rectangular orifice into a high-subsonic crossflow. Doctoral thesis, 6:26031 (AD—A-090343)

TURKEY POINT-3 REACTOR
Radioactive Waste Processing
In-plant source term measurements at Turkey Point Station - Units 3 and 4. Topical report, 6:25536 (NUREG/CR—1629)
Steam Generators
In-plant source term measurements at Turkey Point Station - Units 3 and 4. Topical report, 6:25536 (NUREG/CR—1629)

TURKEY POINT-4 REACTOR
Radioactive Waste Processing
In-plant source term measurements at Turkey Point Station - Units 3 and 4. Topical report, 6:25536 (NUREG/CR—1629)
Steam Generators
In-plant source term measurements at Turkey Point Station - Units 3 and 4. Topical report, 6:25536 (NUREG/CR—1629)

TWO-PHASE FLOW
Entrainment
De-entrainment on vertical elements in air droplet cross flow, 6:26042

U

UCLLL
See LAWRENCE LIVERMORE LABORATORY

U-GAS PROCESS
Demonstration Plants
U-gas technology status. II, 6:24888
Pilot Plants
U-gas technology status. II, 6:24888

ULTRAHIGH-SPEED PHOTOGRAPHY
Psuedo-3D, isodensity and density profiles from fiber optic output of a MACH-130 air shock, 6:26091 (UCRL—85655)

ULTRASONIC TESTING
Reliability
Studies on Section XI ultrasonic repeatability, 6:25503 (EPRI-NP—1858)

UNDERGROUND BUILDINGS
See EARTH-COVERED BUILDINGS

UNDERGROUND EXPLOSIONS
See also NUCLEAR EXPLOSIONS
Ground Subsidence
Why you see what you see looking down at an underground explosion, 6:26102 (UCID—19031)
Ground Uplift
Why you see what you see looking down at an underground explosion, 6:26102 (UCID—19031)

UNDERGROUND POWER TRANSMISSION
Electric Cables
Experimental techniques for investigating the degradation of electrical insulation. Final report, 6:25473 (EPRI-EL—1854)
Oil-Filled Cables
Free and forced convective cooling of pipe-type electric cables. Volume 1: forced cooling of cables. Final report, 6:25478 (EPRI-EL—1872)
Free and forced convective cooling of pipe-type electric cables. Volume 2: electrohycrodynamic pumping. Final report, 6:25479 (EPRI-EL—1872(Vol.2))

UNDERGROUND STORAGE
Radioactive Waste Storage
Waste Isolation Pilot Plant Project (WIPP). Technical progress report for month ending March 31, 1979, 6:25145 (WIPP-DOE—05)
UNDERWATER VEHICLES
See SUBMARINES
UNIFIED GAUGE MODELS
See also WEINBERG-SALAM GAUGE MODEL
Cabibbo Angle
How large are the neutrino mixing angles?, 6:26526
CP Invariance
CP violation at high energies, 6:26563
Decoupling
Decoupling theorems and effective field theories, 6:26542
Flavor Model
Generalized mixing angles in gauge theories with natural flavor conservation, 6:26524
Higgs Model
Higgs phase in non-Abelian gauge theories, 6:26521 (LBL—12840)
Magnetic Monopoles
Suppression of superheavy magnetic monopoles in grand unified theories, 6:26546
Mass Difference
Calculability of the N-P mass difference in gauge theories, 6:26543
P Invariance
Can there be low intermediate mass scales in grand unified theories?, 6:26570
Phase Transformations
Phase transitions and bounds on Higgs-boson masses, 6:26569
Supersymmetry
Sequential internal supersymmetry, 6:26562
Symmetry Breaking
Dynamical symmetry breaking and hypercolor, 6:26545
UNION CARBIDE WASTE PROCESSING SYSTEM
See PUROX PYROLYSIS PROCESS
UNITED KINGDOM
Air Pollution
pH and sulphate content of precipitation over Northern Britain, 6:26136 (CONF-800365—)
Energy Demand
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
UNITED STATES OF AMERICA
See USA
UNLEADED GASOLINE
Fuel Economy
Highway fuel economy of gasohol and unleaded gasoline, 6:25894
UPSILON RESONANCES
Decay
First results on bare b physics, 6:26516
Energy Levels
Inverse scattering and the Y family, 6:26550
Hadronic Particle Decay
Results on the Y resonances from the CUSB group at CESR, 6:26515
Particle Production
First results on bare b physics, 6:26516
Regge Trajectories
Quarkonia and quantum chromodynamics, 6:26523
URANIUM
See also ENRICHED URANIUM
NATURAL URANIUM
Activation Analysis
Determination of uranium and thorium in semiconductor memory materials by high fluence neutron activation analysis, 6:25965 (CONF-810682—3)
Fluorescence Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Marketing Research
Near-term market conditions, 6:25104
Mass Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Prices
Near-term market conditions, 6:25104
X-Ray Fluorescence Analysis
Determination of ultratrace concentrations of uranium and thorium in natural waters by x-ray fluorescence, 6:25964 (CONF-810647—6)
URANIUM 234
Environmental Exposure Pathway
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
Radioecological Concentration
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
URANIUM 238
Environmental Exposure Pathway
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
Radioecological Concentration
Forage uptake of uranium series radionuclides in the vicinity of the anaconda uranium mill, 6:25163 (CONF-801155—6)
URANIUM 238 TARGET
Oxygen 16 Reactions
Precompound emission of light particles in the reaction $^{16}O + ^{238}U$ at 20 MeV/nucleon, 6:26599
URANIUM ALLOYS
See also URANIUM BASE ALLOYS
Magnetization
Magnetization density in paramagnetic UGe_3, 6:25962
Neutron Diffraction
Magnetization density in paramagnetic UGe_3, 6:25962
URANIUM BASE ALLOYS
Mechanical Properties
Effect of titanium content and aging temperature on the properties of uranium-titanium alloys, 6:25916 (Y/DV—73)
Microstructure
Effect of titanium content and aging temperature on the properties of uranium-titanium alloys, 6:25916 (Y/DV—73)
Tensile Properties
Hydrogen content and strain rate effects on the tensile properties of a uranium-titanium alloy, 6:25917 (Y/DV—74)
URANIUM DEPOSITS
Aerial Prospecting
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle (Montana). Final report, 6:25093 (GJBX—179-81-Vol.2A)
Airborne gamma-ray spectrometer and magnetometer survey: Hardin quadrangle (Montana). Final report, 6:25094 (GJBX—179-81-Vol.2B)
Airborne gamma-ray spectrometer and magnetometer survey: Sheridan quadrangle (Wyoming). Final report, 6:25095 (GJBX—179-81-Vol.2C)
Airborne gamma-ray spectrometer and magnetometer survey: Roundup quadrangle (Montana). Final report, 6:25096 (GJBX—179-81-Vol.2D)
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle, Round Up quadrangle, Hardin quadrangle (Montana), Sheridan quadrangle, (Wyoming). Final report, 6:25092 (GJBX—179-81-Vol.1)
Airborne gamma-ray spectrometer and magnetometer survey: Jordan quadrangle, Miles City quadrangle, Glendive quadrangle (Montana), Watford City quadrangle, (North Dakota). Final report, 6:25097 (GJBX—180-81-Vol.1)
Mass Transfer
Microcracks and energy. Progress report, April 1, 1980-February 28, 1981, 6:25089 (DOE/ER/04972—1)
Prospecting
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)

Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)

URANIUM DIOXIDE
Thermal Conductivity
Analysis of thermal conductivity probes for high temperature applications, 6:25537 (SAND—81-0106)

URANIUM IONS
Emission Spectra
Generation and identification of UIII lines. Annual report, 6:26453 (DOE/ET/33066—2)
Ion-Ion Collisions
Theory of positron production in heavy-ion collisions, 6:26466

URANIUM MILLS
See FEED MATERIALS PLANTS

URANIUM OXIDES U3O8
Availability
Long-run price projections for uranium: an evaluation of methodologies. Final report (Eureka code), 6:25088 (CRA—79-313-S)
Prices
Long-run price projections for uranium: an evaluation of methodologies. Final report (Eureka code), 6:25088 (CRA—79-313-S)

URANIUM TELLURIDES
Magnetic Properties
Neutron diffraction study of USbsub(1-x)Tesub(x) solid solutions, 6:25963
Neutron Diffraction
Neutron diffraction study of USbsub(1-x)Tesub(x) solid solutions, 6:25963

URBAN AREAS
Construction
Urban revitalization and displacement: types, causes, and public policy, 6:25728 (UT/CES-PS—16)
Land Use
Urban revitalization and displacement: types, causes, and public policy, 6:25728 (UT/CES-PS—16)
Public Policy
Urban revitalization and displacement: types, causes, and public policy, 6:25728 (UT/CES-PS—16)

UREA
Environmental Effects
Acidification effect of urea and sulfur application on the forest soil in a percolation experiment, 6:26185 (CONF-800365—)

UREA-FORMALDEHYDE FOAMS
Performance Testing
Performance characteristics of foamed-in-place urea formaldehyde insulation, 6:25721 (ORNL-SUB—78/86993/1)
Physical Properties
Performance characteristics of foamed-in-place urea formaldehyde insulation, 6:25721 (ORNL-SUB—78/86993/1)

UROTROPIN
Chemical Reactions
Exploratory study of reactivity in organic compounds subjected to shock loading, 6:25993 (SAND—81-1386C)

US DOE
See also AMES LABORATORY
ANL
BARTLESVILLE ENERGY TECHNOLOGY CENTER
ENERGY INFORMATION ADMINISTRATION
HANFORD RESERVATION
LASL
LAWRENCE LIVERMORE LABORATORY
ORNL
SAVANNAH RIVER PLANT
STANFORD LINEAR ACCELERATOR CENTER
Contracts
Utility view of DOE's enrichment policies, 6:25098
Demonstration Programs
Solar Program Directory: appendix A, 6:25222 (DOE/MI/01002—T5(App.A))
Radioactive Waste Management
Department of Energy waste management program by the Office of Nuclear Waste Management, 6:25161
USDOE needs in modeling for low-level radioactive waste management, 6:25106 (CONF-801217—)
Research Programs
DOE nuclear program--promise and perspective, 6:25614
Overview of the Department of Energy program for the recovery of energy and materials from urban solid waste, 6:25845
Solar Program Directory: appendix A, 6:25222 (DOE/MI/01002—T5(App.A))
Special care needed in selecting projects for the Alternative Fuels Program, 6:25636 (EMD—81-36)
Thermochemical conversion of biomass to fuels and feedstocks: an overview of R & D activities funded by the Department of Energy, 6:25290
Spent Fuel Storage
Department of Energy waste management program by the Office of Nuclear Waste Management, 6:25161

US EPA
Pollution Regulations
Evaluation of potential impacts to the utility sector for compliance with RCRA, 6:25840 (EPA/600/9—81-019B)

USA
(For national information only. See individual states for specific references.)
See also MID-ATLANTIC REGION
NORTH ATLANTIC REGION
SOUTHWEST REGION
VIRGINIA
Electric Utilities
Study of factors governing US utility nuclear power decisions, 6:25482 (DOE/ET/34009—T1)
Energy Conservation
Facts about industrial energy conservation in the United States, 6:25676 (CONF-7910214—)
Energy Demand
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
Fossil-Fuel Power Plants
Cost and quality of fuels for electric utility plants: Energy data report. 1980 annual, 6:25632 (DOE/EIA—0191(80))
Petroleum Deposits
Estimating undiscovered oil resources: an engineering approach, 6:24973
Power Plants
Inventory of power plants in the United States. 1980 annual, 6:25435 (DOE/EIA—0095(80))

UTAH
Land Reclamation
Engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26197 (DOE/UMT—0102)
Summary of the engineering assessment of inactive uranium mill tailings. Vitro site, Salt Lake City, Utah, 6:26198 (DOE/UMT—0102S)
Oil Sand Deposits
rf heating of Utah tar sands. Final report, October 1978-December 1979, 6:25083 (DOE/CH/90035—4)
Wind Power
Techniques for assessing the wind energy resource in the Southern Rocky Mountain region, 6:25417 (PNL—3671)

UTILITIES
See ELECTRIC UTILITIES
PUBLIC UTILITIES

V

V-A THEORY
(Weak interaction theory involving current-current vector-axial vector type of interaction.)
Coupling Constants
Measurement of the vector and axial vector coupling constants in $\Lambda^0 \rightarrow p + e^- +$ nu-bar, 6:26505

VACUUM PUMPS
Valves
Pressure surge limiting valve for vacuum pump inlet piping, 6:26048

VACUUM SYSTEMS
Limiter/vacuum system for plasma impurity control and exhaust in tokamaks, 6:26681 (CONF-801011—96)

VALUES
Economic Analysis
Energy and value, 6:25600 (ORAU/IEA—81-5(M))
VALVES
See also RELIEF VALVES
Design
Lock hopper valves for coal gasification. Final report, 6:24842 (DOE/ET/10669—T7)
Pressure surge limiting valve for vacuum pump inlet piping, 6:26048
Diagrams
Lock hopper valves for coal gasification. Final report, 6:24842 (DOE/ET/10669—T7)
Materials
Lock hopper valves for coal gasification. Final report, 6:24842 (DOE/ET/10669—T7)
Performance Testing
Anchor/Darling Double-Disc Gate Valve, METC SOA Test Valve No. A-12 and Test Valve No. A-12R state-of-the-art Lockhopper Valve-Testing and Development Project. Summary test report, 6:24855 (DOE/MC—169)
Lock hopper valves for coal gasification. Final report, 6:24842 (DOE/ET/10669—T7)
W-K-M Dyna-Seal Ball Valve METC SOA Test Valve No. A-7, state-of-the-art lockhopper valve-testing and development project. Summary test report, 6:24854 (DOE/MC—159)
VAN ALLEN BELTS
See RADIATION BELTS
VANADATES
Melting Points
Use of fuel additives in oil firing, 6:25061 (EPRI-WS—80-127)
VANADIUM
Electric Conductivity
Electrical and thermal transport coefficients of pure vanadium, 6:25922
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Thermal Conductivity
Electrical and thermal transport coefficients of pure vanadium, 6:25922
VANADIUM ALLOYS
See also VANADIUM BASE ALLOYS
Fracture Properties
Development of fracture toughness measurement capability by ultrasound. Final report, 6:26044 (BDX—613-2625)
Phase Stability
Thermodynamics and phase equilibria in the binary systems of vanadium with IV B elements, 6:25907 (IS-M—319)
Phase Studies
Thermodynamics and phase equilibria in the binary systems of vanadium with IV B elements, 6:25907 (IS-M—319)
Thermodynamic Properties
Thermodynamics and phase equilibria in the binary systems of vanadium with IV B elements, 6:25907 (IS-M—319)
VANADIUM BASE ALLOYS
Crystallography
Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices, 6:25957
Electron Diffraction
Crystallogaphic orientation of A15 V_3Ga and Nb_3Al precipitates in BCC Matrices, 6:25957
Tensile Properties
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)
VANADIUM OXIDES
Melting Points
Use of fuel additives in oil firing, 6:25061 (EPRI-WS—80-127)
VAPOR PRESSURE
Isotope Effects
$^{12}C/^{13}C$ and H/D vapor pressure isotope effects of fluoroform: intermolecular interactions in liquid fluoroform, 6:26452 (DOE/ER/10612—3)
VEGETATION
See PLANTS
VEHICLES
See also AUTOMOBILES
BUSES
ELECTRIC-POWERED VEHICLES
FLYWHEEL-POWERED VEHICLES
TRUCKS
Automotive Fuels
Alternative fuels data bank, 6:25888 (DOE/BETC/IC—80/3(Vol.4))
Feasibility study: utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamas County, Oregon, 6:25892 (DOE/RA/50366—T1)
Bibliographies
Inspection, maintenance and repair of motor vehicles. Subject bibliography, 6:25868 (PB—81-109761)
Electric Discharges
Spark discharge characteristics of vehicles energized by ac electric fields, 6:25869 (PB—81-114720)
Inspection
Inspection, maintenance and repair of motor vehicles. Subject bibliography, 6:25868 (PB—81-109761)
Maintenance
Inspection, maintenance and repair of motor vehicles. Subject bibliography, 6:25868 (PB—81-109761)
Stirling Engines
Computer simulation of the transient response of a 4 cylinder Stirling engine with burner and air preheater in a vehicle (CNTLA, CNTLB, and WARM.FOR), 6:25875 (DOE/NASA/0226—1)
VENTILATION SYSTEMS
Design
Design guides for cell atmosphere controls, utilities and fire protection, 6:26317 (DP-MS—81-1)
VERMONT
Wind Power
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)
VERTICAL AXIS TURBINES
See also DARRIEUS ROTORS
Performance
Wind assisted deep-well pumping, 6:25429
VIRGINIA
Wind Power
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)
VLASOV EQUATION
See BOLTZMANN-VLASOV EQUATION
VOLCANOES
Health Hazards
Health hazard evaluation determination report no. HE 79-31-699, University Corporation for Atmospheric Research, Mauna Loa Observatory, Hilo, Hawaii 96720, 6:26151 (PB—81-111247)
VOLTAIC CELLS
See ELECTRIC BATTERIES
VOLTMETERS
Design
Tester line voltage monitor, 6:25471 (BDX—613-2449)

W

W BOSON
See INTERMEDIATE BOSONS
WASHINGTON
Basalt
Relationships between internal structures and petrographic textures of basalt flows: example from a continental flood tholeiite province, 6:26429 (RHO-BWI-SA—67)

WASTE DISPOSAL
See also RADIOACTIVE WASTE DISPOSAL
SANITARY LANDFILLS
Cost
Evaluation of potential impacts to the utility sector for compliance with RCRA, 6:25840 (EPA/600/9—81-019B)
Legal Aspects
Policy overview of the issues of waste flow control, 6:25629 (ANL/CNSV-TM—60)
Site Selection
Geophysical techniques for selection, analysis and monitoring of waste disposal sites, 6:25160
WASTE HEAT
Heat Recovery
Technical-economical aspects of mechanical energy production from waste heat by using organic fluids working on Rankine cycles, 6:25768 (CONF-800272—)
WASTE HEAT UTILIZATION
See also ENERGY CASCADE
Cyclic reheat for FGD: status report. Final report, 6:25454 (EPRI-CS—1843)
Study on an example of heat supply from waste heat. Final report, 6:25804 (PB—81-104879)
Utilization of reject heat (Book), 6:25617
Resource Potential
Use of low-grade reject heat (Book chapter), 6:25618
WASTE MANAGEMENT
See also RADIOACTIVE WASTE MANAGEMENT
WASTE DISPOSAL
WASTE PROCESSING
Government Policies
Policy overview of the issues of waste flow control, 6:25629 (ANL/CNSV-TM—60)
WASTE OIL REFINERIES
Design
Engineering design of a solvent treatment/distillation used lubricating oil re-refinery, 6:25045 (DOE/BETC/IC—80/3(Vol.4))
WASTE OILS
Recycling
Application of the BETC re-refining technology to some state-of-the-art commercial lube oils, 6:25046 (DOE/BETC/RI—81/1)
WASTE PROCESSING
See also ACTIVATED SLUDGE PROCESS
ANAEROBIC DIGESTION
HICHLOR PROCESS
LIME-SODA SINTER PROCESS
MATERIALS RECOVERY
OCCIDENTAL FLASH PYROLYSIS PROCESS
PUROX PYROLYSIS PROCESS
RADIOACTIVE WASTE PROCESSING
Equipment
Air classification, 6:26056 (ANL/CNSV-TM—60)
Application of trommeling to prepared fuels, 6:26055 (ANL/CNSV-TM—60)
Shredding for prepared fuel systems, 6:26054 (ANL/CNSV-TM—60)
Meetings
ELMIA-AVFALL 79 (Combined heat-power production; composting; research and practices; waste recovery; hazardous waste), 6:25835 (CONF-7909198—)
WASTE PROCESSING PLANTS
Design
Feasibility of geothermal heat use in the San Bernardino Municipal Wastewater Treatment Plant. Final report, September 1980-June 1981, 6:25408 (DOE/SF/11442—T1)
Economic Analysis
Feasibility of geothermal heat use in the San Bernardino Municipal Wastewater Treatment Plant. Final report, September 1980-June 1981, 6:25408 (DOE/SF/11442—T1)
Equipment
Waste fuel densification: review of the technology and applications, 6:25202 (ANL/CNSV-TM—60)
Financing
International conference on prepared fuels and resource recovery, 6:26300 (ANL/CNSV-TM—60)
Geothermal Heating Systems
Feasibility of geothermal heat use in the San Bernardino Municipal Wastewater Treatment Plant. Final report, September 1980-June 1981, 6:25408 (DOE/SF/11442—T1)
Health Hazards
Technical assisTAnce report ta 80-33, Omaha waste pretreatment plant, omaha, Nebraska, 6:26150 (PB—81-111148)
Investment
International conference on prepared fuels and resource recovery, 6:26300 (ANL/CNSV-TM—60)
Surveys
Technical assisTAnce report ta 80-33, Omaha waste pretreatment plant, omaha, Nebraska, 6:26150 (PB—81-111148)
WASTE SOLUTIONS
See LIQUID WASTES
WASTE WATER
Activated Sludge Process
Biological removal of organic constituents in high-Btu coal gasification wastewaters, 6:24924 (CONF-8006171—1)
Efficacy of activated sludge/powdered activated carbon for removal of organic constituents in wastewater from commercial-scale, high-Btu coal gasification plant, 6:24925 (CONF-8006171—2)
Contamination
Effects of moisture content on long-term survival and regrowth of bacteria in wastewater sludge, 6:26313
Environmental Effects
On-site flume studies for assessment of effluent impacts on stream aufwuchs communities, 6:26237
Ion Exchange Chromatography
Use of macroreticular resin for separation of coal conversion process wastewater, 6:24931
Liquid Column Chromatography
Use of macroreticular resin for separation of coal conversion process wastewater, 6:24931
Waste Processing
Use of macroreticular resin for separation of coal conversion process wastewater, 6:24931
Water Pollution Control
Efficacy of activated sludge/powdered activated carbon for removal of organic constituents in wastewater from commercial-scale, high-Btu coal gasification plant, 6:24925 (CONF-8006171—2)
WASTE-FUELED BOILERS
See REFUSE-FUELED BOILERS
WASTE-FUELED POWER PLANTS
See REFUSE-FUELED POWER PLANTS
WASTE-ROCK INTERACTIONS
Nuclear waste management. Quarterly progress report, January-March, 1981, 6:25130 (PNL—3000-9)
WATER
See also FRESH WATER
GROUND WATER
HEAVY WATER
SEAWATER
SURFACE WATERS
WASTE WATER
Hydrogen-carbon monoxide reactions in low-rank coal liquefaction, 6:24878
Chemical Analysis
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Degassing
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 9. Design approaches: CAES. Appendix B. Champagne effect. Final report, 6:25570 (EPRI-EM—1589(Vol.9)(App.B))
Dielectric Properties
Dielectric relaxation of oil-external microemulsions, 6:25994
Hot Atom Chemistry
Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2i + H_2O$, $H_3^+ + D_2O$, and $D_3^+ + H_2O$, 6:26006

Ion-Molecule Collisions
Crossed molecular beam studies of proton transfer, unimolecular decay, and isotope scrambling in the reactions $H_2^+ + H_2O$, $H_2^+ + D_2O$, and $D_2^+ + H_2O$, 6:26006
Mixing
Direct firing of coal-water suspensions: state-of-the-art review, 6:24965
Phase Studies
Interfacial phenomena, phase behavior, and rock/fluid interactions in surfactant/polymer enhanced oil recovery systems, 6:25023 (DOE/BETC/IC—80/3(Vol.2))
Solubility
Micellar-flood research: biopolymers, interfacial and phase behavior, and competitive adsorbates, 6:25020 (DOE/BETC/IC—80/3(Vol.2))

WATER CHEMISTRY
Comparative Evaluations
Acidified lake districts of the world: a comparison of water chemistry of lakes in southern Norway, southern Sweden, southwestern Scotland, the Adirondack Mountains of New York, and southeastern Ontario, 6:26285 (CONF-800365—)
Data Analysis
Regional surveys of the chemistry of small Norwegian lakes: a statistical analysis of the data from 1974 to 1978, 6:26258 (CONF-800365—)

WATER COOLED REACTORS
See also BWR TYPE REACTORS
PWR TYPE REACTORS
Meltdown
Light water reactor safety research program. Quarterly report Jan-Mar 80, 6:25535 (NUREG/CR—1509)
Physical Protection
Guide to the design of physical protection systems for light water reactors, 6:25173 (SAND—81-0586C)
Reactor Components
Qualification testing evaluation program light-water reactor safety research. Quarterly report Jul-Sep 79, 6:25534 (NUREG/CR—1492)

WATER CURRENT POWER GENERATORS
Environmental Impacts
Ocean energy technologies: an environmental overview, 6:25321
Technology Assessment
Ocean energy technologies: an environmental overview, 6:25321

WATER HEATERS
See also ANNUAL CYCLE ENERGY SYSTEM
SOLAR WATER HEATERS
Coefficient of Performance
Demonstration of a heat-pump water heater, 6:25710 (CONF-810672—10)
Demonstration Programs
Demonstration of a heat-pump water heater, 6:25710 (CONF-810672—10)
Design
Research, development, and demonstration of a high-efficiency gas fired water heater. Final report 1979-80, 6:25724 (PB—81-113656)
Economics
Comparison of conventional and solar-water-heating products and industries report, 6:25328 (DOE/CS/30217—T1)
Efficiency
Research, development, and demonstration of a high-efficiency gas fired water heater. Final report 1979-80, 6:25724 (PB—81-113656)
Fuel Consumption
Energy: comparative energy consumption of space and water heating appliances, 6:25730
Performance Testing
Energy: comparative energy consumption of space and water heating appliances, 6:25730
Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980, 6:25720 (NBSIR—80-2145(DOE))
Thermal Efficiency
Comparison of conventional and solar-water-heating products and industries report, 6:25328 (DOE/CS/30217—T1)
Waste Heat Utilization
Study of an integrated appliance, the air conditioner/heat pump-heat recovery unit-water heater. Final report, November 1980, 6:25720 (NBSIR—80-2145(DOE))

WATER HYACINTHS
Environmental Effects
Use of microcosms in the study of habitat changes caused by the growth and perturbation of a water hyacinth community, 6:26232

WATER POLLUTION
Distribution
Brownian-motion model of pollutant-concentration distributions. Study on statistics and environmental factors in health (SIMS), 6:26145 (DOE/EV/10428—11)
Monitoring
Metal tracers in two marine microcosms: sensitivity to scale and configuration, 6:26290
Preliminary evaluation of DOE-NEPA monitoring system, 6:26147 (DOE/EV/10475—1)
Reviews
Significant issues in water resources policy, 6:26299

WATER PUMPS
Efficiency
Efficiency improvements in irrigation well pumps, 6:25809
Energy Consumption
Efficiency improvements in irrigation well pumps, 6:25809

WATER QUALITY
Monitoring
Evolution of acidity in surface waters of Laurentides Park (Quebec, Canada) over a period of 40 years, 6:26255 (CONF-800365—)
Regional Analysis
Evidence of acidification of rivers of Eastern Canada, 6:26262 (CONF-800365—)
Seasonal Variations
Atmospheric inputs to three Adirondack lake watersheds, 6:26268 (CONF-800365—)

WATER RESERVOIRS
Cost
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix A. Upper reservoir. Final report, 6:25574 (EPRI-EM—1589(Vol.8)(App.A))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix E. Lower reservoir. Final report, 6:25575 (EPRI-EM—1589(Vol.8)(App.E))
Design
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix A. Upper reservoir. Final report, 6:25574 (EPRI-EM—1589(Vol.8)(App.A))
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 8. Design approaches: UPH. Appendix E. Lower reservoir. Final report, 6:25575 (EPRI-EM—1589(Vol.8)(App.E))
Environmental Effects
Effect of fluctuating reservoir release on the downstream environment, 6:26288 (PB—81-115677)

WATER RESOURCES
Information Systems
Oilfield water analysis data bank and estimates of water available for enhanced oil recovery in the northern shelf area of Oklahoma, 6:24978 (DOE/BETC/IC—80/3(Vol.1))
Power Potential
Small hydroelectric potential at existing hydraulic structures in California. Bulletin 211, 6:25208 (DOE/R9/10019—T2)
Small hydroelectric potential at existing hydraulic structures in California. Appendixes: data and guidelines for development. Bulletin 211, 6:25207 (DOE/R9/10019—T1)

WATER SOURCE HEAT PUMPS
Surveys
Geothermal policy project. Quarterly report, November 1, 1979-January 31, 1980, 6:25407 (DOE/SF/01795—T2)

WATERFLOODING
See also CAUSTIC FLOODING

Chemical Reaction Kinetics
Dynamic interfacial properties and their effects on oil ganglia reconnection and displacement processes, 6:25024 (DOE/BETC/IC—80/3(Vol.2))
Relative permeability of low tension systems at elevated temperatures, 6:25026 (DOE/BETC/IC—80/3(Vol.2))
Field Tests
Big Muddy low-tension flood process demonstration project, 6:25007 (DOE/BETC/IC—80/3(Vol.2))
Enhanced oil recovery by improved waterflooding in the Storms Pool Field, Illinois, 6:25008 (DOE/BETC/IC—80/3(Vol.2))

WATERSHEDS
See also COLUMBIA RIVER BASIN
Acid Rain
Sulfur distribution and flux in two forested watersheds in eastern Tennessee, 6:26256 (CONF-800365—)
Acidification
Atmospheric deposition in Norway during the last 300 years as recorded in SNSF lake sediments. II. Diatom stratigraphy and inferred pH, 6:26272 (CONF-800365—)
Chemical characteristics and buffer capacity of fifty alpine lakes (Italy, Pennine-Lepontine Alps), 6:26259 (CONF-800365—)
Framework for the integrated lake-watershed acidification study, 6:26266 (CONF-800365—)
Input-output budgets of major ions at gauged catchments in Norway, 6:26265 (CONF-800365—)
Preliminary characterization of three lake basins sensitive to acid precipitation in Nova Scotia, Canada, 6:26257 (CONF-800365—)
Ecology
Ecology of acid streams draining forested and non-forested catchments in Scotland, 6:26280 (CONF-800365—)
Geochemistry
Importance of natural H^+ production for acidity in soil and water, 6:26260 (CONF-800365—)
Input-Output Analysis
Analysis of lake acidification using annual budgets, 6:26267 (CONF-800365—)
Input-output budgets of major ions at gauged catchments in Norway, 6:26265 (CONF-800365—)
Mathematical Models
Framework for the integrated lake-watershed acidification study, 6:26266 (CONF-800365—)
Runoff
Use of radioactive tracers to study runoff and soil-water intereactions in natural mini-catchments, 6:26183 (CONF-800365—)

WAVE ENERGY CONVERTERS
Specifications
Fabrication, testing, and modeling plans for a 125-kW counter-rotating-turbine wave energy converter, 6:25410 (SERI/TP—634-1215)

WAVES (SHOCK)
See SHOCK WAVES

WAY OF LIFE
See QUALITY OF LIFE

WEAK BOSON
See INTERMEDIATE BOSONS

WEAK HADRONIC DECAY
Quantum Chromodynamics
Penguins and the $\Delta I = 1/2$ rule, 6:26538

WEATHER
Data Analysis
Earth tempering as a passive design strategy, 6:25362

WEEDS
Energy Source Development
Production of nonwoody land plants as a renewable energy source, 6:25282

WEINBERG-SALAM GAUGE MODEL
Metastable States
Vortex excitations in the Weinberg-Salam theory, 6:26568

WELDED JOINTS
Ultrasonic Testing
Studies on Section XI ultrasonic repeatability, 6:25503 (EPRI-NP—1858)

WELDS
See WELDED JOINTS

WELL DRILLING
See also ROTARY DRILLS
Computer Codes
Programmers manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 1, 6:25404 (SAND—80-7154/1)
Programmer's manual for IOSYM: an input-oriented simulation language for continuous systems. Volume 2: subprogram description, 6:25405 (SAND—80-7154/2)

WELLS
See also GEOTHERMAL WELLS
NATURAL GAS WELLS
OIL WELLS
Meetings
Third invitational well-testing symposium: well testing in low permeability environments, 6:26404 (LBL—12076)
Testing
Role of well testing in civil engineering, 6:26096 (LBL—12076)

WEST GERMANY
See FEDERAL REPUBLIC OF GERMANY

WEST VALLEY PROCESSING PLANT
Radioactive Waste Storage
Electrical and electronic subsystems of a nuclear waste tank annulus inspection system, 6:25141 (RHO-SA—221)

WEST VIRGINIA
Oil Wells
Granny's Creek CO_2 injection project, clay county, west virginia., 6:25037
Wind Power
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)

WESTINGHOUSE GASIFICATION PROCESS
Process Development Units
Advanced coal-gasification system for electric-power generation. Fourth quarterly progress report, July 1-September 30, 1980, 6:24850 (DOE/ET/14752—T5)

WHEAT
Hydrolysis
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw, 6:25406 (DOE/ID/12051—T1)

WIND POWER
Availability
Planetary boundary-layer wind model evaluation at a mid-Atlantic coastal site, 6:25420 (DOE/ET/23007—80/1)
Geomorphology
Assessing the local windfield with instrumentation, 6:25423 (PNL—3622)
Mathematical Models
Planetary boundary-layer wind model evaluation at a mid-Atlantic coastal site, 6:25420 (DOE/ET/23007—80/1)
Meetings
Agricultural energy. Volume 2. Biomass energy crop production, 6:25275
Monitoring
Assessing the local windfield with instrumentation, 6:25423 (PNL—3622)
Resource Assessment
Techniques for assessing the wind energy resource in the North Central region, 6:25414 (PNL—3667)
Techniques for assessing the wind energy resource in the Southeast region, 6:25416 (PNL—3669)
Techniques for assessing the wind energy resource in the Southern Rocky Mountain region, 6:25417 (PNL—3671)
Techniques for assessing the wind energy resource in the Southwest region, 6:25418 (PNL—3672)
Techniques for assessing the wind energy resource in Hawaii and Pacific Islands region, 6:25419 (PNL—3673)
Techniques for assessing the wind energy resource in the Great Lakes region, 6:25415 (PNL—3668)
Techniques for assessing the wind energy resource in the Northeast region, 6:25413 (PNL—3452)
Techniques for assessing the wind energy resource in the East Central region, 6:25412 (PNL—3451)

Shear
Some aspects of fluctuating vertical wind shears, 6:25424 (PNL—3771)

WIND POWER PLANTS
Construction
Upland Hills Ecological Awareness Center solar air-heating system: control, monitoring, and documentation grant. Final report, 6:25377 (DOE/R5/10123—1)
Site Surveys
Wind resource of the area surrounding Medicine Bow, Wyoming, 6:25422 (PB—81-109621)

WIND TURBINES
See also VERTICAL AXIS TURBINES
Agriculture
Improved control strategy for wind-powered refrigerated storage of apples, 6:25432
Simulation model to evaluate the performance of windmill systems, 6:25431
Control Systems
Improved control strategy for wind-powered refrigerated storage of apples, 6:25432
Damage
Lightning-accommodation systems for wind-turbine-generator safety, 6:25421 (DOE/NASA/20320—31)
Economics
Economic analysis of wind energy for irrigation pumping, 6:25430
Irrigation
Economic analysis of wind energy for irrigation pumping, 6:25430
Lightning
Lightning-accommodation systems for wind-turbine-generator safety, 6:25421 (DOE/NASA/20320—31)
Refrigerating Machinery
Improved control strategy for wind-powered refrigerated storage of apples, 6:25432
Simulation model to evaluate the performance of windmill systems, 6:25431
Research Programs
Wind energy systems quarterly review, January 1-March 31, 1981, 6:25411 (SERI/PR—635-1239)
Site Selection
Assessing the local windfield with instrumentation, 6:25423 (PNL—3622)

WIND-POWERED PUMPS
Operation characteristics of a utility-free dwelling in Kansas, 6:25363

WIRES
Transients
Direct time-domain techniques for transient radiation and scattering from wires, 6:26625

WISCONSIN
Acid Rain
Susceptibility of aquatic and terrestrial resources of Minnesota, Wisconsin, and Michigan to impacts from acid precipitation: informational requirements, 6:26122 (CONF-800365—)
Energy Models
Energy modeling. Volume II. Inventory and details of state energy models (Book), 6:25592 (DOE/CS/10046—2(Vol.2))
Refuse-Fueled Power Plants
Development and implementation of prepared solid waste fuels to energy projects through the architectural/engineering approach, 6:25825 (ANL/CNSV-TM—60)
Regional Analysis
Susceptibility of aquatic and terrestrial resources of Minnesota, Wisconsin, and Michigan to impacts from acid precipitation: informational requirements, 6:26122 (CONF-800365—)
Resource Recovery Facilities
Americology Resource Recovery System, 6:25203 (ANL/CNSV-TM—60)
Wind Power
Techniques for assessing the wind energy resource in the Great Lakes region, 6:25415 (PNL—3668)

WOOD
Gasification
Thermochemical gasification of woody biomass, 6:25186
Wood gasification: an old technology with new potential for the eighties, 6:25292
Liquefaction
Effects of reaction conditions on the aqueous thermochemical conversion of biomass to oil, 6:25284
Materials Handling
Receipt and preparation of biomass as an energy source., 6:25451
Pyrolysis
Gasification engineering. Quarterly report, January-March 1981, 6:25185 (SERI/PR—622-1153)
Resource Assessment
Report on alternate fuels manufactured from high temperature solar thermal systems, 6:25339 (DOE/ET/21067—T1)
Thermochemical Processes
Preliminary economic overview of large-scale thermal conversion system using wood feedstocks, 6:25291

WOOD BURNING APPLIANCES
Air Pollution
Technology assessment of solar energy systems: air-quality effects of direct-solar and biomass systems in high- and low-deployment scenarios, 6:25229 (ANL/EES-TM—140)

WOOD PRODUCTS INDUSTRY
See also PAPER INDUSTRY
Heat Recovery
Development of original water/steam heat pump for industrial applcations, 6:25779 (CONF-800272—)

WOOD WASTES
Compacting
Biomass densification energy requirements, 6:25206
Extrusion
Biomass densification energy requirements, 6:25206
Gasification
Conversion of forest residues to a clean gas for fuel or synthesis., 6:25190
Thermal conversion of solid wastes and biomass, 6:25183
Wood gasification: an old technology with new potential for the eighties, 6:25292
Liquefaction
Thermal conversion of solid wastes and biomass, 6:25183
Materials Handling
Receipt and preparation of biomass as an energy source., 6:25451
Pyrolysis
Pyrolytic oils - characterization and data development for continuous processing. Report for Jun 76-Mar 80, 6:25184 (PB—81-110959)
Thermal conversion of solid wastes and biomass, 6:25183

WOOD-FUEL POWER PLANTS
Fuel Systems
Receipt and preparation of biomass as an energy source., 6:25451
Planning
Energy plantation and the photosynthesis energy factory, 6:25285

WORKERS
See PERSONNEL

WORMS (ROUND)
See NEMATODES

WORMS (SEGMENTED)
See ANNELIDS

WYOMING
Baseline Ecology
Tongue River in Wyoming: a baseline fisheries assessment, Monarch to the state line, 6:26297 (ANL/LRP—10)
In-Situ Gasification
Statistical model fitting of remote induction sounding data from underground coal gasification site--Hanna II, phases 2 and 3, 6:24885
Magnetic Surveys
Airborne gamma-ray spectrometer and magnetometer survey: Sheridan quadrangle (Wyoming). Final report, 6:25095 (GJBX—179-81-Vol.2C)
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle, Round Up quadrangle, Hardin quadrangle (Montana), Sheridan quadrangle, (Wyoming). Final report, 6:25092 (GJBX—179-81-Vol.1)

Radiometric Surveys
Airborne gamma-ray spectrometer and magnetometer survey: Sheridan quadrangle (Wyoming). Final report, 6:25095 (GJBX—179-81-Vol.2C)
Airborne gamma-ray spectrometer and magnetometer survey: Forsyth quadrangle, Round Up quadrangle, Hardin quadrangle (Montana), Sheridan quadrangle, (Wyoming). Final report, 6:25092 (GJBX—179-81-Vol.1)
Wind
Wind resource of the area surrounding Medicine Bow, Wyoming, 6:25422 (PB—81-109621)

X

2X DEVICES
Energy Losses
Large-acceptance-angle gridded analyzers in an axial magnetic field, 6:26644 (UCRL—52981)
XENON
Atom-Atom Collisions
Interaction potentials for Br(^{2}P)+Ar, Kr, and Xe (^{1}S) by the crossed molecular beams method, 6:26460
Laser Spectroscopy
Resonance ionization spectroscopy: counting noble-gas atoms, 6:26451 (CONF-8106100—1)
Separation Processes
Permeation cascades for the separation of krypton and xenon from nuclear reactor atmospheres, 6:25567
Separation of krypton and xenon by selective permeation, 6:25516
X-RAY DETECTION
Reviews
Photoemission measurements for low energy x-ray detector applications, 6:26609 (LA-UR—81-1712)
X-RAY DOSIMETRY
Lyoluminescence
Applications of lyoluminescence, 6:26085
X-RAY SOURCES
Power Supplies
Operation of the new Hermes II Marx, 6:26710 (SAND—81-0750C)
X-RAY SPECTROMETERS
Fabrication
Epoxy replication for Wolter x-ray microscope fabrication, 6:26636 (LA-UR—81-1611)
XYLENES
Oxidation
HPLC and phase transfer catalysis in the analysis of oxidation products of lignite liquids and model compounds (Oxidizing agents: trifluoroperacetic acid, ruthenium tetraoxide, ceric ammonium nitrate, potassium permanganate), 6:24912

Y

YANG-MILLS THEORY
Analytical Solution
Comments on the linear system for the self-dual Yang-Mills fields, 6:26566 (BNL—29548)
YIELD (BIOLOGICAL)
See PRODUCTIVITY
YTTERBIUM
De Haas-Van Alphen Effect
Pressure dependence of the Fermi surface of hcp Yb, 6:25924
Fermi Level
Pressure dependence of the Fermi surface of hcp Yb, 6:25924
YTTRIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
YTTRIUM 80
Decay
Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$, 6:26583 (BNL—29658)
YTTRIUM 81
Decay
Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$, 6:26583 (BNL—29658)
YTTRIUM 82
Decay
Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$, 6:26583 (BNL—29658)
YTTRIUM 89 TARGET
Boron 10 Reactions
Isomeric and high-spin states of ^{94}Tc and the search for yrast isomers near $N \sim 50$, 6:26587
YTTRIUM ALLOYS
Magnetic Properties
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
Superconductivity
Superconductivity and magnetism in the series $R_2Fe_3Si_5$ by Moessbauer and magnetization measurements, 6:25896 (CONF-801134—15)
YTTRIUM OXIDES
Physical Radiation Effects
Special Purpose Materials annual progress report, October 1, 1979, 6:25902 (DOE/ER—0048/1)

Z

ZEA MAYS
See MAIZE
ZERO POWER REACTORS
Multiplication Factors
Reckoning THOR, 6:25514 (LA—8856-MS)
ZINC
Biochemical Reaction Kinetics
Heavy-metal and nutrients effects on sediment oxygen demand in three-phase aquatic microcosms, 6:26224
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Environmental Transport
Comparison of lead, manganese, and zinc transport in three Adirondack lake watersheds, New York, 6:26269 (CONF-800365—)
Toxicity
Effect of calcium on the toxicity of zinc and lead compounds in the water medium, 6:26362 (CONF-800365—)
ZINC 65
Radioecological Concentration
Relative mobilization of zinc, cerium, and americium from sediment in an aquatic microcosm, 6:26293
ZINC 66 TARGET
Carbon 12 Reactions
High-spin states and band structure in ^{76}Br, 6:26586
ZINC BROMIDES
Catalytic Effects
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877

Comparative Evaluations
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877

ZINC CHLORIDES
Catalytic Effects
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877
Comparative Evaluations
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877

ZINC IODIDES
Catalytic Effects
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877
Comparative Evaluations
Participation of hydrogen in the hydrogenolysis and hydrogenation of coal-related model compounds catalyzed by zinc halides (Model compounds are dibenzyl ether; 4-hydroxydiphenyl methane (4HDM); 1-benzylnaphthalene (1BN); 1-naphthol), 6:24877

ZINC OXIDES
Mechanical Properties
Microstructural and mechanical property evaluation of zinc oxide coated solar collectors, 6:25384
Microstructure
Microstructural and mechanical property evaluation of zinc oxide coated solar collectors, 6:25384

ZIRCALOY 4
Corrosion Resistance
Study on high-temperature corrosion resistance of Zircaloy-4 with spheroidized hydrides, 6:25932
Oxidation
Temperature estimates from the Zircaloy oxidation kinetics in the α plus β phase region, 6:25522 (CONF-810801—3(Summ.))

ZIRCONIUM
Emission Spectroscopy
Hydrogeochemical and stream sediment reconnaissance basic data for Chandalar Quadrangle, Alaska, 6:25091 (GJBX—172-81)
Hydrogeochemical and stream sediment reconnaissance basic data for Wiseman Quadrangle, Alaska, 6:25090 (GJBX—171-81)
Form Factors
Field induced magnetic form factor of Zr, 6:25933
Neutron Diffraction
Field induced magnetic form factor of Zr, 6:25933

ZIRCONIUM 83
Decay
Spectroscopic and decay energy measurements for isotopes with $79 \leqq A \leqq 84$ and $N \approx Z$, 6:26583 (BNL—29658)

ZIRCONIUM 92 TARGET
Deuteron Reactions
Collective and neutron-structure effects in the elastic scattering of vector polarized deuterons in the $A = 90$ mass region, 6:26584

ZIRCONIUM 94 TARGET
Deuteron Reactions
Collective and neutron-structure effects in the elastic scattering of vector polarized deuterons in the $A = 90$ mass region, 6:26584

ZIRCONIUM 96 TARGET
Deuteron Reactions
Collective and neutron-structure effects in the elastic scattering of vector polarized deuterons in the $A = 90$ mass region, 6:26584

ZIRCONIUM ALLOYS
Tensile Properties
Alloy development for irradiation performance. Quarterly progress report for period ending March 31, 1981, 6:25901 (DOE/ER—0045/6)

ZIRCONOLITE
Crystal Structure
Zirconolite and its crystallographic characteristics, 6:25989 (LA-tr—81-10)
Phase Studies
Zirconolite and its crystallographic characteristics, 6:25989 (LA-tr—81-10)

ZONES (AURORAL)
See AURORAL ZONES

ZOOPLANKTON
See also CRUSTACEANS
DAPHNIA
PROTOZOA
Population Dynamics
Phytoplankton and zooplankton in acidified lakes in South Norway, 6:26379 (CONF-800365—)
Steady-state zooplankton community in a feedback culture system, 6:26228
Trophic interactions in experimental marine ecosystems perturbed by oil, 6:26396

ZT-40 DEVICES
Magnetic Field Configurations
Internal magnetic probe data from ZT-40, 6:26694 (LA—8753MS)

CONTRACT NUMBER INDEX

Numbers assigned to DOE contracts under which reports announced in this publication were prepared are included in this index.

Contract No.	*Abstract No.*	*Report No.*
AB03-77CS31522	**Stanford Univ., CA (USA)**	
	6:25334	DOE/CS/31522—T2
AC01-76ET10669	**Consolidated Controls Corp., El Segundo, CA (USA)**	
	6:24842	DOE/ET/10669—T7
AC01-77CS10210	**Applied Communication Research, Inc., Palo Alto, CA (USA)**	
	6:25327	DOE/CS/10210—T1
	6:25849	DOE/CS/10210—T2
AC01-77CS10220	**Pittsburgh Univ., PA (USA). Research Inst. for Energy Policy**	
	6:25718	DOE/CS/10220—T1
AC01-77CS58840	**Energy and Environmental Analysis, Inc., Arlington, VA (USA)**	
	6:25754	DOE/CS/58840—T1
AC01-77ET13060	**Conoco, Inc., Stamford, CT (USA)**	
	6:24843	DOE/ET/13060—T3(Vol.2)
	6:24844	DOE/ET/13060—T3(Vol.6)
	6:24845	DOE/ET/13060—T3(Vol.7)
	6:24846	DOE/ET/13060—T3(Vol.12)
	6:24847	DOE/ET/13060—T3(Vol.13)
	6:24848	DOE/ET/13060—T4
AC01-78CS20098	**Dynatech R/D Co., Cambridge, MA (USA)**	
	6:25181	DOE/CE/20098—1
AC01-78ET12103	**Filtrol Corp., Los Angeles, CA (USA)**	
	6:24864	FE—2595-6
AC01-79CS20095	**Hagler, Bailly and Co., Washington, DC (USA)**	
	6:25763	CONF-800272—
AC01-79CS20237	**Lockman and Associates, Monterey Park, CA (USA)**	
	6:25838	DOE/CE/20237—1
AC01-79CS30027	**Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.**	
	6:25351	SOLAR/0022—81/39
	6:25352	SOLAR/2038—81/14
AC01-79CS40287	**Energy Concepts Co., Annapolis, MD (USA)**	
	6:25797	DOE/CS/40287—T1
AC01-79ET14809	**Brigham Young Univ., Provo, UT (USA)**	
	6:24851	DOE/ET/14809—6
AC01-79ET23108	**RCA Labs., Princeton, NJ (USA)**	
	6:25249	DOE/ET/23108—7
AC01-80CS10070	**Market Facts, Inc., Washington, DC (USA)**	
	6:25217	DOE/CS/10070—T1
AC01-80CS40352	**American Inst. of Baking, Manhattan, KS**	
	6:25798	DOE/CS/40352—T1
AC01-80MI01002	**Solar America, Inc., Albuquerque, NM**	
	6:25218	DOE/MI/01002—T5
	6:25222	DOE/MI/01002—T5(App.A)
	6:25223	DOE/MI/01002—T5(App.C)
	6:26302	DOE/MI/01002—T5(App.B)
AC01-80PE70278	**Harvard Univ., Cambridge, MA (USA). John Fitzgerald Kennedy School of Government**	
	6:25041	DOE/PE/70278—T14
	6:26172	DOE/PE/70278—T15
AC01-80RG10367	**Systems and Applied Sciences Corp., Riverdale, MD (USA)**	
	6:25640	DOE/RG/10367—T3
AC01-80RG10446	**Decision Analysis Corp., Annandale, VA (USA)**	
	6:24969	DOE/RG/10446—T1
	6:25800	DOE/RG/10446—T2
AC01-81EI11096	**Rehab Group, Inc., Falls Church, VA (USA)**	
	6:25590	DOE/EIA/11096—T1
AC02-70CS10046	**Colorado School of Mines, Golden (USA)**	
	6:25592	DOE/CS/10046—2(Vol.2)
AC02-76CH00016	**Brookhaven National Lab., Upton, NY (USA)**	
	6:25389	BNL—51230
	6:25452	BNL—51329
	6:25517	BNL—29358
	6:25626	BNL—51359
	6:25637	BNL—51326
	6:25690	BNL—51299
	6:25834	BNL—29282
	6:26066	BNL—29588
	6:26104	BNL—51385
	6:26105	BNL—51386
	6:26112	BNL—29526
	6:26113	BNL—29741
	6:26114	BNL—51289
	6:26331	BNL—29433
	6:26566	BNL—29548
	6:26583	BNL—29658
	6:26595	BNL-NCS—51360
	6:26608	BNL—28332
AC02-76CH03000	**Fermi National Accelerator Lab., Batavia, IL (USA)**	
	6:26075	DOE/CH/03000—T3
	6:26077	FERMILAB-Conf—81/40-EXP
AC02-76ER03072	**Princeton Univ., NJ (USA). Elementary Particles Lab.**	
	6:26482	DOE/ER/03072—120
AC02-76ER03326	**Martin Marietta Labs., Baltimore, MD (USA)**	
	6:26308	DOE/ER/03326—101
AC02-76ET11292	**Thermo Electron Corp., Waltham, MA (USA)**	
	6:25659	DOE/ET/11292—T4
	6:25660	DOE/ET/11292—T5
AC02-76ET11304	**Energy Research Corp., Danbury, CT (USA)**	
	6:25664	DOE/ET/11304—T12
AC02-76ET20279	**Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.**	
	6:25296	DOE/ET/20279—115
	6:25578	DOE/ET/20279—130
AC02-76EV03425	**Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Garmisch-Partenkirchen (Germany, F.R.). Inst. fuer Atmosphaerische Umweltforschung**	
	6:26143	DOE/ET/03425—21
AC02-76EV03490	**Rochester Univ., NY (USA). Dept. of Radiation Biology and Biophysics**	
	6:26392	UR—3490-2026
	6:26401	UR—3490-2024
AC02-77CH00178	**Solar Energy Research Inst., Golden, CO (USA)**	
	6:25185	SERI/PR—622-1153
	6:25220	SERI/TP—753-1205
	6:25231	SERI/TR—744-876
	6:25257	SERI/PR—8104-3-T3
	6:25258	SERI/PR—8142-4-T2
	6:25259	SERI/PR—8279-1-T2
	6:25260	SERI/PR—9131-1-T3
	6:25261	SERI/PR—9175-1-T3
	6:25262	SERI/PR—9272-1-T1
	6:25263	SERI/TR—8274-1-T1
	6:25264	SERI/TR—9053-1-T3
	6:25320	SERI/TP—631-1270

Contract No.	Abstract No.	Report No.
	6:25348	SERI/TP—353-467
	6:25349	SERI/TP—641-1222
	6:25350	SERI/TR—98348-1
	6:25410	SERI/TP—634-1215
	6:25411	SERI/PR—635-1239
	6:25427	SERI/TR—8085-1-T1
	6:25428	SERI/TR—8085-1-T2
	6:25954	SERI/TR—8002-6-T1
AC02-77ET28013	**Potomac Electric Power Co., Washington, DC (USA)**	
	6:25210	EPRI-EM—1589(Vol.8)(App.C)
	6:25213	EPRI-EM—1589(Vol.13)
	6:25568	EPRI-EM—1589(Vol.6)
	6:25569	EPRI-EM—1589(Vol.7)
	6:25570	EPRI-EM—1589(Vol.9)(App.B)
	6:25571	EPRI-EM—1589(Vol.9)(App.E)
	6:25574	EPRI-EM—1589(Vol.8)(App.A)
	6:25575	EPRI-EM—1589(Vol.8)(App.E)
	6:25576	EPRI-EM—1589(Vol.10)
AC02-78ET21056	**Lockheed Missiles and Space Co., Sunnyvale, CA (USA). Ocean Energy Systems**	
	6:25316	DOE/ET/21056—T3
AC02-79CS10046	**Colorado School of Mines, Golden (USA). Research Inst.**	
	6:25591	DOE/CS/10046—2(Vol.1)
AC02-79CS20215	**Carnegie-Mellon Inst. of Research, Arlington, VA (USA). Energy Conservation Policy Center**	
	6:25663	DOE/CS/20215—T1
AC02-79CS30245	**California Solar Business Office, Sacramento (USA)**	
	6:25329	DOE/CS/30245—T1
AC02-79ER10458	**Calspan Corp., Buffalo, NY (USA)**	
	6:25978	DOE/ER/10458—2
AC02-79ER10518	**Massachusetts Inst. of Tech., Cambridge (USA)**	
	6:25799	DOE/ER/10518—2
AC02-79ET10815	**Tennessee Univ., Tullahoma (USA). Space Inst.**	
	6:25650	DOE/ET/10815—T4
AC02-79ET21067	**New Hampshire Univ., Durham (USA). Dept. of Chemical Engineering**	
	6:24841	CONF-801104—16
	6:24852	DOE/ET/21067—2
	6:25339	DOE/ET/21067—T1
AC02-79ET27242	**Technecon Analytic Research, Inc., Philadelphia, PA (USA)**	
	6:25393	DOE/ET/27242—T1
AC02-79ET29356	**Westinghouse Electric Corp., Muncie, IN (USA). Large Power Transformer Div.**	
	6:25472	DOE/ET/29356—6
AC02-79ET34009	**Stoller (S.M.) Corp., New York (USA)**	
	6:25482	DOE/ET/34009—T1
AC02-80ER10603	**Nebraska Univ., Lincoln (USA). Dept. of Chemistry**	
	6:25991	DOE/ER/10603—1
AC02-80ER10612	**State Univ. of New York, Stony Brook (USA)**	
	6:26452	DOE/ER/10612—3
AC02-80ER10762	**Pennsylvania State Univ., University Park (USA)**	
	6:26426	DOE/ER/10762—1
AC02-80ER10765	**Arizona State Univ., Tempe (USA). Dept. of Chemistry**	
	6:26427	DOE/ER/10765—T1
AC02-80ET17019	**General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.**	
	6:25665	DOE/ET/17019—3
AC02-80EV10403	**Illinois Univ., Urbana (USA). Dept. of Nuclear Engineering**	
	6:25966	DOE/EV/10403—2
	6:25967	DOE/EV/10403—3
AC02-80EV10428	**Stanford Univ., CA (USA). Dept. of Statistics**	
	6:26144	DOE/EV/10428—8
	6:26145	DOE/EV/10428—11
	6:26733	DOE/EV/10428—9
AC02-80EV10449	**Indiana Univ., Bloomington (USA). School of Public and Environmental Affairs**	
	6:26146	DOE/EV/10449—T1
AC02-80EV10475	**ESCOR, Inc., Northfield, IL (USA)**	
	6:26147	DOE/EV/10475—1
AC02-80EV10503	**State Univ. of New York Downstate Medical Center, Brooklyn (USA). Dept. of Radiation Oncology**	
	6:26316	DOE/EV/10503—1
AC03-76CS40215	**Kaiser Aluminium and Chemical Corp., Pleasanton, CA (USA)**	
	6:25796	DOE/CS/40215—T1
AC03-76ET12056	**Stanford Univ., CA (USA). Petroleum Research Inst.**	
	6:25034	DOE/ET/12056—12
AC03-76SF00515	**Stanford Linear Accelerator Center, CA (USA)**	
	6:26082	SLAC-TN—81-2
	6:26090	SLAC-PUB—2738
	6:26728	SLAC-PUB—2727
AC03-77CS31590	**Carrier Corp., Syracuse, NY (USA). Energy Systems Div.**	
	6:25335	DOE/CS/31590—
AC03-77CS51381	**General Electric Co., Cincinnati, OH (USA). Space Div.**	
	6:25075	GESP—813
	6:25823	GESP—785
AC03-77SF01435	**General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.**	
	6:25504	DOE/SF/01435—T1
AC03-78CS20329	**Science Applications, Inc., La Jolla, CA (USA)**	
	6:25726	SAI—026-79-855-LJ
	6:25727	SAI—026-79-858-LJ
AC03-78CS40177	**Union Carbide Corp., Tarrytown, NY (USA). Tarrytown Technical Center**	
	6:25182	DOE/CS/40177—T2
AC03-78ET20517	**Aerospace Corp., El Segundo, CA (USA)**	
	6:25224	ATR—80(7747)-1(Vol.1)
	6:25225	ATR—80(7747)-1(Vol.2)
AC03-79CS10757	**Science Applications, Inc., La Jolla, CA (USA)**	
	6:25807	SAI—444-80-533-LJ
AC03-79CS20315	**Energy Applications, Columbia, MD (USA)**	
	6:25719	DOE/CS/20315—T11
AC03-79ET21007	**Martin Marietta Corp., Denver, CO (USA). Denver Div.**	
	6:25303	MCR—78-1331A
AC03-79ET27041	**Geothermal Power Corp., Novato, CA (USA)**	
	6:25409	GT—27041-4
AC03-79ET27203	**UOP, Inc., Des Plaines, IL (USA)**	
	6:25394	DOE/ET/27203—1
AC03-79SF10499	**Rockwell International Corp., Canoga Park, CA (USA). Rocketdyne Div.**	
	6:25298	DOE/SF/10499—T29
	6:25299	DOE/SF/10499—T30
	6:25300	DOE/SF/10499—T31
	6:25301	DOE/SF/10499—T33
	6:25302	DOE/SF/10499—T34
	6:25304	MDC-G—9330
	6:25305	SAN—0499-53
AC03-80CS30217	**Science Applications, Inc., Golden, CO (USA)**	
	6:25328	DOE/CS/30217—T1
AC03-80SF10846	**Aerojet Energy Conversion Co., Sacramento, CA (USA)**	
	6:25078	DOE/TIC—11452
AC03-76CS551213	**AiResearch Mfg. Co., Torrance, CA (USA)**	
	6:25882	DOE/CS/51213—T6
AC04-76DP00053	**Mound Facility, Miamisburg, OH (USA)**	
	6:24869	MLM-MU—81-62-0007
	6:24905	MLM—2829(OP)
	6:25067	MLM—2831(OP)

Contract No.	Abstract No.	Report No.
	6:25102	MLM—2842(OP)
	6:25969	MLM—2840(OP)
	6:25981	MLM—2817(OP)
	6:26722	MLM—2841(OP)
AC04-76DP00487	**Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)**	
	6:26097	MHSMP—81-28
	6:26098	MHSMP—81-29
AC04-76DP00613	**Bendix Corp., Kansas City, MO (USA)**	
	6:25471	BDX—613-2449
	6:25944	BDX—613-2565
	6:26013	BDX—613-2582
	6:26014	BDX—613-2594
	6:26015	BDX—613-2634
	6:26016	BDX—613-2635
	6:26044	BDX—613-2625
	6:26049	BDX—613-2626
	6:26050	BDX—613-2629
AC04-76DP00789	**Sandia National Labs., Albuquerque, NM (USA)**	
	6:24873	SAND—81-1347C
	6:25035	SAND—81-0882C
	6:25142	SAND—80-1935
	6:25143	SAND—81-0925
	6:25173	SAND—81-0586C
	6:25178	SAND—81-8006
	6:25219	SAND—81-0764
	6:25256	SAND—81-1164C
	6:25306	SAND—79-8189
	6:25307	SAND—79-8192/1
	6:25308	SAND—80-8190
	6:25347	SAND—81-8223
	6:25382	SAND—80-2867C
	6:25403	SAND—80-7057
	6:25404	SAND—80-7154/1
	6:25405	SAND—80-7154/2
	6:25425	SAND—81-7017
	6:25426	SAND—81-7026
	6:25537	SAND—81-0106
	6:25538	SAND—81-0353C
	6:25580	SAND—81-8225
	6:25589	SAND—81-0226C
	6:25607	SAND—81-1359C
	6:25910	SAND—80-0732
	6:25911	SAND—80-2800C
	6:25912	SAND—80-2847C
	6:25913	SAND—80-2864C
	6:25914	SAND—81-0041C
	6:25915	SAND—81-0108C
	6:25937	SAND—80-0019C
	6:25940	SAND—80-2836C
	6:25952	SAND—81-1315C
	6:25953	SAND—81-1354C
	6:25971	SAND—81-0156C
	6:25982	SAND—80-2594C
	6:25984	SAND—81-1352C
	6:25985	SAND—81-1455C
	6:25992	SAND—81-1350C
	6:25993	SAND—81-1386C
	6:26018	CONF-810583—1
	6:26023	SAND—80-2865C
	6:26024	SAND—81-0810
	6:26046	SAND—81-1477C
	6:26047	SAND—81-1528C
	6:26051	SAND—80-1132
	6:26062	SAND—81-0050C
	6:26072	SAND—81-0844C
	6:26088	SAND—80-2689C
	6:26089	SAND—81-0650C
	6:26403	SAND—81-0640
	6:26430	SAND—81-0856
	6:26614	SAND—80-2694C
	6:26620	SAND—81-1065
	6:26706	SAND—80-2500
	6:26707	SAND—81-0477C
	6:26708	SAND—81-0599C
	6:26709	SAND—81-0695C
	6:26710	SAND—81-0750C
	6:26711	SAND—81-0751C
	6:26712	SAND—81-1524C
	6:26723	SAND—80-1952
	6:26724	SAND—80-2602C
	6:26725	SAND—80-8053
	6:26726	SAND—81-0627
	6:26727	SAND—81-0859

Contract No.	Abstract No.	Report No.
AC04-76DP03533	**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**	
	6:25169	RFP—3159
AC04-76GJ01658	**Ford, Bacon and Davis Utah, Inc., Salt Lake City (USA)**	
	6:25122	DOE/UMT—0103
	6:25123	DOE/UMT—0103S
	6:26197	DOE/UMT—0102
	6:26198	DOE/UMT—0102S
AC04-77CS34126	**General Electric Co., Philadelphia, PA (USA). Space Div.**	
	6:25336	DOE/CS/34126—T1
AC05-76ER04206	**Georgia Inst. of Tech., Atlanta (USA)**	
	6:25508	DOE/ER/04206—T1
AC05-76OR00033	**Oak Ridge Associated Universities, Inc., TN (USA)**	
	6:25600	ORAU/IEA—81-5(M)
AC05-78OR03054	**International Coal Refining Co., Allentown, PA (USA)**	
	6:24857	DOE/OR/03054—T5
AC06-76RL01830	**Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation**	
	6:25129	ONWI—9(2)(80)
	6:25130	PNL—3000-9
	6:25131	PNL—3678
	6:25132	PNL—3742
	6:25133	PNL—3752
	6:25134	PNL-SA—9102
	6:25165	PNL—3789
	6:25412	PNL—3451
	6:25413	PNL—3452
	6:25414	PNL—3667
	6:25415	PNL—3668
	6:25416	PNL—3669
	6:25417	PNL—3671
	6:25418	PNL—3672
	6:25419	PNL—3673
	6:25423	PNL—3622
	6:25424	PNL—3771
	6:25572	PNL—3470
	6:25573	PNL—3804
	6:25909	PNL-SA—9255
	6:26177	PNL—3212
	6:26391	PNL—3700Pt.2Suppl.
AC06-77RL01030	**Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations**	
	6:25135	RHO-BWI-C—94
	6:25136	RHO-BWI-CD—51(Rev.2)
	6:25137	RHO-BWI-SA—64
	6:25138	RHO-C—50
	6:25139	RHO-CD—80-615
	6:25140	RHO-LD—49
	6:25141	RHO-SA—221
	6:26417	RHO-BWI-C—56
	6:26429	RHO-BWI-SA—67
AC06-79ET23007	**Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Engineering Science and Mechanics**	
	6:25420	DOE/ET/23007—80/1
AC07-76ID01570	**Idaho National Engineering Lab., Idaho Falls (USA)**	
	6:25209	DOE/ID/01570—T21(Vol.1)
	6:25211	DOE/ID/01570—T21(Vol.2)App.A-K
	6:25212	DOE/ID/01570—T21(Vol.3)App.L
	6:25522	CONF-810801—3(Summ.)
	6:25525	GEND—001
	6:25903	EGG-M—01981
AC07-79ID01675	**Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)**	
	6:25125	ENICO—1086
AC08-78DP40052	**Rockwell International Corp., Canoga Park, CA (USA). Rocketdyne Div.**	
	6:26689	DOE/DP/40052—T1
AC08-79DP40086	**Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.**	
	6:26690	DOE/DP/40086—1(Vol.1)
	6:26691	DOE/DP/40086—1(Vol.2)

Contract No.	Abstract No.	Report No.
AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.**	
	6:25124	DPST—80-466
	6:26002	DP-TR—19
	6:26165	DP—1556
	6:26294	DP-MS—81-64
	6:26317	DP-MS—81-1
AC09-76SR00819	**Savannah River Ecology Lab., Aiken, SC (USA)**	
	6:26211	SRO-NERP—3
AC09-79ET47921	**Allied-General Nuclear Services, Barnwell, SC (USA)**	
	6:25101	AGNS—47921-2.1-14
AC11-76PN00292	**Duquesne Light Co., Shippingport, PA (USA)**	
	6:25483	DLCS—5000181
AC13-76GJ01664	**Charles River Associates, Inc., Boston, MA (USA)**	
	6:25088	CRA—79-313-S
	6:25092	GJBX—179-81-Vol.1
	6:25093	GJBX—179-81-Vol.2A
	6:25094	GJBX—179-81-Vol.2B
	6:25095	GJBX—179-81-Vol.2C
	6:25096	GJBX—179-81-Vol.2D
	6:25097	GJBX—180-81-Vol.1
AC14-76FF02170	**Hanford Engineering Development Lab., Richland, WA (USA)**	
	6:25099	HEDL-SA—2332-FP
	6:25494	HEDL-SA—2203-FP
	6:25495	HEDL-SA—2405-FP
	6:25500	HEDL-SA—2322-FP
	6:25501	HEDL-SA—2303-FP
	6:25502	HEDL-SA—2323
	6:25509	HEDL-SA—2105-FP
	6:25510	HEDL-SA—2194
	6:25511	HEDL-SA—2300
	6:25512	HEDL-SA—2316-FP
	6:25513	HEDL-SA—2373-FP
	6:25526	HEDL-SA—2329-FP
	6:25904	HEDL-SA—2137
	6:26166	HEDL-SA—2302
AC15-76CL02395	**Westinghouse Electric Corp., Madison, PA (USA). Advanced Reactors Div.**	
	6:25490	CONF-810804—4
AC18-78FC02030	**Combustion Power Co., Inc., Menlo Park, CA (USA)**	
	6:24957	DOE/FC/02030—T1
AC19-79BC10043	**Southwest Research Inst., San Antonio, TX (USA)**	
	6:25052	DOE/BC/10043—25
AC19-79BC20001	**Texas Univ., Austin (USA). Dept. of Petroleum Engineering**	
	6:24974	DOE/BC/20001—10
AC21-76ET10381	**Georgetown Univ., Washington, DC (USA)**	
	6:26060	DOE/ET/10381—150
AC21-79MC10389	**Tetra Tech, Inc., Columbus, OH (USA)**	
	6:25068	DOE/MC/10389—T1
AC21-80ET14752	**Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.**	
	6:24850	DOE/ET/14752—T5
AC22-76ET10532	**Chevron Research Co., Richmond, CA (USA)**	
	6:24863	FE—2315-60
AC22-77ET10482	**Pennsylvania State Univ., University Park (USA). Dept. of Chemistry**	
	6:24903	DOE/ET/10482—T1
AC22-79ET14700	**Utah Univ., Salt Lake City (USA). Dept. of Mining and Fuels Engineering**	
	6:24849	DOE/ET/14700—5
AC22-80PC30041	**Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)**	
	6:25968	DOE/PC/30041—T2
AC22-80PC30080	**Gulf Research and Development Co., Pittsburgh, PA (USA)**	
	6:24858	DOE/PC/30080—T3
AC22-80PC30205	**McDonnell Douglas Electronics Co., St. Charles, MO (USA)**	
	6:24943	DOE/PC/30205—T1
AC22-80PC30264	**Occidental Research Corp., Irvine, CA (USA)**	
	6:24859	DOE/PC/30264—06
AC65-80WP15223	**Westinghouse Electric Corp., Raleigh, NC (USA)**	
	6:25475	EPRI-EL—1860(Vol.3)
AC80-78BP02810	**Brown Boveri Compuguard Corp., Pittsburgh, PA (USA)**	
	6:25474	EPRI-EL—1860(Vol.2)
AI01-76CS31037	**National Aeronautics and Space Administration, Washington, DC (USA)**	
	6:25340	DOE/NASA/CR—161730
	6:25862	DOE/NASA/0008—12
AI01-76ET20320	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	6:25421	DOE/NASA/20320—31
AI01-76ET20485	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	6:25297	DOE/NASA/0180—1
AI01-77CS51040	**Chrysler Corp., Detroit, MI (USA)**	
	6:25863	DOE/NASA/0144—81/1
	6:25864	DOE/NASA/51040—26
	6:25865	DOE/NASA/51040—28
	6:25875	DOE/NASA/0226—1
	6:25876	DOE/NASA/51040—25
AI01-77ET10350	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	6:26010	DOE/NASA/2593—27
AI01-77ET10769	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	6:25651	DOE/NASA/10769—14
AI01-77ET26945	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	6:25579	DOE/NASA/0138—1
AI01-79CS20396	**Norske Veritas, Oslo (Norway). Industrial and Offshore Div.**	
	6:25253	DOE/NOAA/OTEC—38
	6:25317	DOE/NOAA/OTEC—35
	6:25318	DOE/NOAA/OTEC—36
AI01-80ER10160	**Department of Commerce, Boulder, CO (USA). Inst. for Telecommunication Sciences**	
	6:25295	DOE/ER/10160—T5
	6:26437	DOE/ER/10160—4
AI01-80ET17088	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	6:25667	DOE/NASA/0201—2
	6:25668	DOE/NASA/6229—2
AI02-79CH10003	**Department of Commerce, Boulder, CO (USA)**	
	6:25294	DOE/CH/10003—1
AI02-80CH10048	**National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center**	
	6:26436	DOE/CH/10048—1
AI03-76ET33003	**Sandia Labs., Livermore, CA (USA)**	
	6:25657	DOE/ET/33003—T2
AI04-80AL12726	**United Technologies Corp., South Windsor, CT (USA)**	
	6:25666	DOE/NASA/0126—1
	6:25669	DOE/NASA/12726—8
AI08-76DP00539	**Environmental Protection Agency, Las Vegas, NV (USA). Environmental Monitoring Systems Lab.**	
	6:26195	DOE/DP/00539—040
	6:26196	DOE/DP/00539—042
AM02-76CH03073	**Princeton Univ., NJ (USA). Plasma Physics Lab.**	
	6:26638	PPPL—1773
	6:26639	PPPL—1787
	6:26640	PPPL—1788
	6:26641	PPPL—1789

Contract No.	Abstract No.	Report No.
	6:26642	PPPL—1804
	6:26643	PPPL-Q—38
	6:26703	PPPL—1797
	6:26704	PPPL—1803
	6:26705	PPPL—1809
AM03-76SF00893	**General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.**	
	6:25491	DOE/SF/00893—T4
AM21-80MC14522	**TRW, Inc., Cleveland, OH (USA)**	
	6:24854	DOE/MC—159
	6:24855	DOE/MC—169
AP21-81MC17783	**Capp (John P.), Morgantown, WV (USA)**	
	6:24856	DOE/MC/17783—T1
AS02-76ER03416	**Pennsylvania State Univ., University Park (USA). Dept. of Chemistry**	
	6:25996	DOE/ER/03416—21
AS02-76ER04054	**Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory**	
	6:26425	DOE/ER/04054—5
AS02-76ET37237	**Purdue Univ., Lafayette, IN (USA). School of Nuclear Engineering**	
	6:25497	PNE—81-149
AS02-76ET53041	**Northwestern Univ., Evanston, IL (USA)**	
	6:26632	DOE/ET/53041—13
AS02-76EV01599	**Michigan State Univ., Hickory Corners (USA). W.K. Kellogg Biological Station**	
	6:26207	DOE/EV/01599—T1(Pt.1)
	6:26208	DOE/EV/01599—T1(Pt.3)
	6:26209	DOE/EV/01599—T1(Pt.4)
	6:26210	DOE/EV/01599—T1(Pt.5)
AS02-76EV02283	**Michigan State Univ., East Lansing (USA)**	
	6:26315	DOE/EV/02283—2
AS02-76EV02530	**Iowa State Univ. of Science and Technology, Ames (USA)**	
	6:26191	DOE/EV/02530—17
AS02-77ER04380	**Boston Univ., MA (USA). Dept. of Chemistry**	
	6:25248	DOE/ER/04380—T1
AS02-77ET26704	**Lehigh Univ., Bethlehem, PA (USA)**	
	6:25616	DOE/ET/26704—7
AS02-78CS34697	**California State Univ., Fullerton (USA)**	
	6:25338	DOE/CS/34697—T3
	6:25390	DOE/CS/34697—T1
AS02-78ER04972	**Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Earth and Planetary Sciences**	
	6:25089	DOE/ER/04972—1
AS02-78ER10107	**Massachusetts Inst. of Tech., Cambridge (USA)**	
	6:26692	DOE/ER/10107—2
AS02-78RA04934	**Franklin Pierce Law Center, Concord, NH (USA). Energy Law Inst.**	
	6:25598	DOE/CE/04934—46
AS05-76ER04936	**Oak Ridge National Lab., TN (USA)**	
	6:26592	CONF-810649—6
AS05-78ER06035	**Rice Univ., Houston, TX (USA)**	
	6:25997	DOE/ER/06035—3
AS05-78OR06102	**Florida Univ., Gainesville (USA). Coll. of Engineering**	
	6:25499	DOE/OR/06102—T1
AS05-79ER10407	**North Carolina State Univ., Raleigh (USA). Dept. of Physics**	
	6:26602	DOE/ER/10407—2
AS05-79ER10424	**Kentucky Univ., Lexington (USA). Dept. of Chemistry**	
	6:25998	DOE/ER/10424—1
AS05-80ET33066	**Florida Univ., Gainesville (USA). Dept. of Nuclear Engineering Sciences**	
	6:26453	DOE/ET/33066—2
AS07-79ID12051	**Colorado State Univ., Fort Collins (USA). Dept. of Agricultural and Chemical Engineering**	
	6:25406	DOE/ID/12051—T1
AT02-76CH90035	**IIT Research Inst., Chicago, IL (USA)**	
	6:25083	DOE/CH/90035—4
AT03-76ET35300	**General Atomic Co., San Diego, CA (USA)**	
	6:25485	GA-A—16234
	6:25946	GA-A—16001
AT03-76ET35301	**General Atomic Co., San Diego, CA (USA)**	
	6:25486	GA-A—16269
	6:25948	GA-A—16270
	6:26020	GA-A—16161
AT03-76ET51011	**General Atomic Co., San Diego, CA (USA)**	
	6:26718	GA-A—16148
AT03-76ET53025	**SRI International, Menlo Park, CA (USA)**	
	6:26631	DOE/ET/53025—T8
AT03-76SF70030	**General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.**	
	6:25492	DOE/SF/70030—T18
	6:25523	DOE/SF/70030—T19
AT03-76SF71032	**General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.**	
	6:25524	DOE/SF/71032—T10
AT03-76SF76026	**Rockwell International Corp., Palo Alto, CA (USA). Energy Systems Group**	
	6:25493	DOE/SF/76026—T7
AT03-80SF11512	**General Atomic Co., San Diego, CA (USA)**	
	6:26693	GA-A—14847
AT18-78FC10121	**North Dakota Univ., Grand Forks (USA)**	
	6:24853	DOE/FC/10121—T1
EY-76-C-04-0789	**Sandia National Labs., Albuquerque, NM (USA)**	
	6:25983	SAND—81-0969C
FC01-78CS35228	**Alderson Broaddus Coll., Philippi, WV (USA)**	
	6:25341	DOE/NASA/CR—161756
FC01-80CS20156	**American Public Works Association, Chicago, IL**	
	6:25839	DOE/CS/20156—T1
FC03-77CS31521	**Pacific Sun, Inc., Palo Alto, CA (USA)**	
	6:25333	DOE/CS/31521—T1
FC03-79CS30310	**Columbia Gas System Service Corp., Columbus, OH (USA)**	
	6:25330	DOE/CS/30310—T1
	6:25331	DOE/CS/30310—T2
FC03-79CS30311	**Hilo Coast Processing Co., Pepeekeo, HI (USA)**	
	6:25332	DOE/CS/30311—T2
FC07-79ID12014	**Montana Dept. of Natural Resources and Conservation, Helena (USA)**	
	6:25392	DOE/ID/12014—T1
FC49-80R910019	**California Dept. of Water Resources, Sacramento (USA)**	
	6:25207	DOE/R9/10019—T1
	6:25208	DOE/R9/10019—T2
FG01-79CS20099	**Philadelphia Zoological Society, PA (USA)**	
	6:25837	DOE/CE/20088—01
FG01-80RA50366	**EMCON Associates, San Jose, CA (USA)**	
	6:25892	DOE/RA/50366—T1
FG02-77CS34135	**Ueland and Junker, Architects and Planners, Philadelphia, PA (USA)**	
	6:25337	DOE/CS/34135—T4
FG02-79R510106	**Southern Illinois Univ., Carbondale (USA)**	
	6:25380	DOE/R5/10106—3
FG02-79R510112	**Illinois Central Coll., East Peoria (USA)**	
	6:25342	DOE/R5/10112—T1
FG02-79R510123	**Upland Hills Ecological Awareness Center, Oxford, MI (USA)**	
	6:25377	DOE/R5/10123—1
FG02-79R510131	**Canby Area Vocational Technical Inst., MN (USA)**	
	6:25192	DOE/R5/10131—2
FG02-80R510217	**Stelle Group, IL (USA)**	
	6:25193	DOE/R5/10217—1
FG03-78SF01795	**National Conference of State Legislatures, Denver, CO (USA)**	
	6:25407	DOE/SF/01795—T2
FG03-80SF11442	**San Bernardino Municipal Water Dept., CA (USA)**	
	6:25408	DOE/SF/11442—T1

Contract No.	Abstract No.	Report No.
FG22-80PC30210	**Ohio Coal Research Lab. Associates, Columbus (USA)**	
	6:24904	DOE/PC/30210—T1
FG44-80R410185	**Buffalo Trace Area Development District, Maysville, KY (USA)**	
	6:25084	DOE/R4/10185—T1
NAS-7-100-954331	**Westinghouse Research and Development Center, Pittsburgh, PA (USA)**	
	6:25250	DOE/JPL/954331—81/14
NAS-7-100-955825	**RCA Labs., Princeton, NJ (USA)**	
	6:25251	DOE/JPL/955825—81/1
NAS-7-100-955909	**Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.**	
	6:25252	DOE/JPL/955909—81/2
W-31-109-ENG-38	**Argonne National Lab., IL (USA)**	
	6:24898	CONF-801263—1
	6:24924	CONF-8006171—1
	6:24925	CONF-8006171—2
	6:24945	ANL/EES-TM—139
	6:24955	CONF-800806—44
	6:24956	CONF-800806—45
	6:25038	ANL/CNSV—10
	6:25120	CONF-810722—1
	6:25163	CONF-801155—6
	6:25164	CONF-8010130—8
	6:25166	CONF-801038—23
	6:25175	CONF-801111—45
	6:25176	CONF-800616—10
	6:25179	CONF-801210—26
	6:25199	ANL/CNSV-TM—60
	6:25229	ANL/EES-TM—140
	6:25322	ANL-K—81-74
	6:25326	CONF-800804—40
	6:25379	CONF-800804—39
	6:25436	ANL/CEN/FE—80-24
	6:25438	CONF-801210—27
	6:25488	CONF-800609—17
	6:25518	CONF-800723—26
	6:25519	CONF-800723—27
	6:25583	ANL/OEPM—80-8
	6:25584	CONF-800612—6
	6:25585	CONF-800806—46
	6:25586	CONF-810315—13
	6:25587	CONF-8010159—11
	6:25604	CONF-801210—25
	6:25638	CONF-800608—8
	6:25639	CONF-800804—41
	6:25645	ANL/MHD—80-19
	6:25646	CONF-800617—8
	6:25647	CONF-800631—10
	6:25648	CONF-800806—42
	6:25649	CONF-800806—43
	6:25801	DOE/TIC—11124
	6:25878	CONF-800939—2
	6:25879	CONF-801242—7
	6:25895	CONF-801124—50
	6:25896	CONF-801134—15
	6:25897	CONF-801134—16
	6:25898	CONF-801148—6
	6:25900	CONF-8006130—3
	6:25934	ANL/MSD/FE—81-1
	6:25935	CONF-800765—10
	6:25945	CONF-800954—4
	6:26017	CONF-800980—38
	6:26063	CONF-800608—7
	6:26064	CONF-8006123—3
	6:26067	CONF-800980—39
	6:26068	CONF-800980—42
	6:26069	CONF-801111—46
	6:26070	CONF-8006123—2
	6:26076	CONF-801103—59
	6:26111	ANL—81-12
	6:26291	CONF-801063—6
	6:26296	ANL/ES—109
	6:26297	ANL/LRP—10
	6:26307	CONF-800963—7
	6:26402	CONF-8008109—1
	6:26447	CONF-800626—8
	6:26448	CONF-800726—2
	6:26449	CONF-801111—49
	6:26450	CONF-8004161—1
	6:26518	ANL-HEP-CP—80-69
	6:26519	ANL-HEP-CP—80-75
	6:26559	ANL-HEP—80-77
	6:26577	CONF-801111—47
	6:26591	CONF-801111—48
	6:26596	CONF-800979—19
	6:26601	CONF-800979—18
	6:26613	CONF-800765—9
	6:26618	CONF-800561—4
	6:26626	CONF-8007106—1
	6:26628	CONF-801011—97
	6:26667	CONF-800707—26
	6:26668	CONF-800740—28
	6:26669	CONF-800950—20
	6:26670	CONF-801011—85
	6:26671	CONF-801011—86
	6:26672	CONF-801011—87
	6:26673	CONF-801011—88
	6:26674	CONF-801011—89
	6:26675	CONF-801011—90
	6:26676	CONF-801011—91
	6:26677	CONF-801011—92
	6:26678	CONF-801011—93
	6:26679	CONF-801011—94
	6:26680	CONF-801011—95
	6:26681	CONF-801011—96
	6:26682	CONF-801011—98
	6:26683	CONF-801011—99
	6:26684	CONF-801011—100
	6:26685	CONF-801011—101
	6:26686	CONF-801011—103
W-7405-ENG-26	**Oak Ridge National Lab., TN (USA)**	
	6:24946	CONF-810607—8
	6:24947	CONF-810607—10
	6:24964	ORNL/TM—7292
	6:24971	CONF-810652—5
	6:25033	DOE/BETC/OR—19
	6:25090	GJBX—171-81
	6:25091	GJBX—172-81
	6:25100	ORNL/TM—7502
	6:25105	CONF-801217—
	6:25119	CONF-810606—48
	6:25172	K/OA—5001
	6:25214	ORNL/TM—7694
	6:25313	CONF-810622—1
	6:25314	CONF-810622—2
	6:25315	CONF-810622—5
	6:25396	ORNL/TM—7718
	6:25462	ORNL/TM—7801
	6:25484	CONF-810606—52
	6:25489	CONF-810606—56
	6:25496	ORNL/TM—7839
	6:25507	CONF-810606—55
	6:25515	ORNL/TM—7761
	6:25520	CONF-810606—42
	6:25521	CONF-810606—54
	6:25710	CONF-810672—10
	6:25711	CONF-810672—16
	6:25720	NBSIR—80-2145(DOE)
	6:25721	ORNL-SUB—78/86993/1
	6:25757	Y—2244
	6:25883	Y/DX—290
	6:25899	CONF-810625—18
	6:25901	DOE/ER—0045/6
	6:25916	Y/DV—73
	6:25917	Y/DV—74
	6:25964	CONF-810647—6
	6:25965	CONF-810682—3
	6:25970	ORNL/TM—7760
	6:26022	ORNL/TM—7665
	6:26032	CONF-810630—6
	6:26081	ORNL—5758
	6:26087	DOE/TIC—1023186
	6:26142	CONF-810621—5
	6:26149	ORNL/TM—7728
	6:26176	ORNL/TM—7759
	6:26192	IAEA-SM—254/63
	6:26287	ORNL/TM—7564
	6:26323	EPRI-EA—1840
	6:26324	EPRI-EA—1874
	6:26388	CONF-810562—1
	6:26389	ORNL/TM—7721
	6:26399	EPRI-EA—1855
	6:26451	CONF-8106100—1
	6:26581	ORNL/TM—7752
	6:26592	CONF-810649—6
	6:26597	CONF-810606—53
	6:26598	CONF-810606—68
	6:26610	ORNL/TM—7818

Contract No.	Abstract No.	Report No.
	6:26612	ORNL/TM—7748
	6:26629	CONF-810606—40
	6:26630	CONF-810606—46
	6:26637	ORNL/TM—7733
	6:26688	CONF-810654—2
	6:26699	LA-UR—81-1641
	6:26700	ORNL/TM—7777
	6:26701	ORNL/TM—7778
	6:26702	ORNL/TM—7828
W-7405-ENG-36	**Los Alamos National Lab., NM (USA)**	
	6:25080	LA-UR—81-1659
	6:25177	LA-UR—81-1050
	6:25399	LA-UR—81-852
	6:25400	LA-UR—81-1265
	6:25514	LA—8856-MS
	6:25527	LA-UR—81-1371
	6:25528	LA-UR—81-1498
	6:25529	LA-UR—81-1519
	6:25530	LA-UR—81-1520
	6:25531	LA-UR—81-1521
	6:25532	LA-UR—81-1556
	6:25670	LA-UR—81-1054
	6:25949	LA—8746-MS
	6:25950	LA-UR—81-1017
	6:25951	LA-UR—81-1044
	6:26021	LA-UR—81-1962
	6:26078	LA—8814-MS
	6:26589	LA-UR—81-1593
	6:26590	LA-UR—81-1721
	6:26609	LA-UR—81-1712
	6:26633	LA—8784-MS
	6:26634	LA—8828-MS
	6:26635	LA-UR—81-1601
	6:26636	LA-UR—81-1611
	6:26694	LA—8753MS
	6:26695	LA—8829-MS
	6:26696	LA-UR—81-1395
	6:26697	LA-UR—81-1416
	6:26698	LA-UR—81-1566
	6:26719	LA-UR—80-3457
	6:26720	LA-UR—80-3642
	6:26721	LA-UR—80-3716
W-7405-ENG-48	**California Univ., Livermore (USA). Lawrence Livermore Lab.**	
	6:24868	LBL—12278
	6:24934	LBL—11896
	6:25079	UCID—19000
	6:25086	UCID—19082
	6:25087	UCRL—85312
	6:25170	UCRL—85458
	6:25171	UCRL—85460
	6:25174	UCRL—53145
	6:25319	LBL—11833
	6:25588	LBL—12657
	6:25671	LBL—12754
	6:25841	LBL—12595
	6:25881	UCRL—85902
	6:25941	UCRL—53124
	6:25942	UCRL—85744
	6:25980	LBL—12761
	6:26011	LBL—12767
	6:26025	UCID—18993
	6:26026	UCRL—85298
	6:26033	UCRL—85653
	6:26052	UCID—19048
	6:26071	LBL—12797
	6:26079	LBL—12380
	6:26083	UCRL—85604
	6:26091	UCRL—85655
	6:26092	UCRL—86285
	6:26099	UCRL—85187
	6:26102	UCID—19031
	6:26148	LBL—10881
	6:26161	UCRL—51444-80
	6:26162	UCRL—84878
	6:26163	UCRL—85754
	6:26200	UCRL—50027-80
	6:26289	UCRL—85673
	6:26400	LBL—12589
	6:26404	LBL—12076
	6:26420	UCRL—53127
	6:26454	LBL—12454
	6:26475	LBL—10909
	6:26520	LBL—12558
	6:26521	LBL—12840
	6:26574	LBL—12596
	6:26615	UCRL—85288
	6:26627	UCID—19062
	6:26644	UCRL—52981
	6:26645	UCRL—85826
	6:26663	UCRL-Trans—11689
	6:26713	UCRL—86041
	6:26714	UCRL—86304
	6:26729	UCRL—86104
W-7405-ENG-82	**Ames Lab., IA (USA)**	
	6:24866	IS-M—317
	6:24867	IS-M—318
	6:24929	IS—4773
	6:24933	IS-M—309
	6:24948	IS-M—311
	6:25905	IS—4762
	6:25906	IS-M—315
	6:25907	IS-M—319
	6:25979	IS-M—316
	6:26045	IS-M—328
	6:26167	IS—4768
	6:26603	IS-M—320

REPORT NUMBER INDEX

The numbers assigned to all reports cited in the publication appear in the first column of the index. The citation numbers are included in the second column. Cross reference information and/or availability are included as appropriate. Abbreviations used in the availability column are elaborated at the end of the index. To expedite the filling of orders for reports from NTIS and TIC, an order number in the form, DE81000001, is appended to the availability statement. Requesters are urged to use this order number where provided. Following the order number, one or more DOE distribution categories are indicated, e.g. , UC-10, UC-25. These category numbers are included to assist DOE librarians in responding to requests for reports in their collections. The UC (Unclassified Distribution Categories) are defined in DOE/TIC-4500, available from TIC.

Report No.	*Abstract No.*	*Availability*
AD-		
460281	6:26100	NTIS, PC A04/MF A01
464381	6:26101	NTIS, PC A04/MF A01
AD-A-		
089736	6:26444	NTIS, PC A03/MF A01
089776	6:25661	NTIS, PC A04/MF A01
089962	6:26109	NTIS, PC A08/MF A01
090113	6:25877	NTIS, PC A04/MF A01
090129	6:25051	NTIS, PC A03/MF A01
090142	6:25851	NTIS, PC A06/MF A01
090280	6:25852	NTIS, PC A03/MF A01
090282	6:25853	NTIS, PC A10/MF A01
090287	6:26445	NTIS, PC A02/MF A01
090337	6:25854	NTIS, PC A03/MF A01
090343	6:26031	NTIS, PC A09/MF A01
090346	6:25581	NTIS, PC A02/MF A01
090377	6:25662	NTIS, PC A02/MF A01
090408	6:25855	NTIS, PC A02/MF A01
090419	6:24923	NTIS, PC A02/MF A01
090426	6:26398	NTIS, PC A02/MF A01
090528	6:26446	NTIS PCMF A01
090549	6:26012	NTIS, PC A02/MF A01
090552	6:26110	NTIS, PC A02/MF A01
090785	6:25582	NTIS, PC A03/MF A01
AD-B-		
028686/ 4	6:25293	NTIS, PC A04/MF A01
AGNS-		
47921-2.1-14	6:25101	NTIS, PC A03/MF A01. Order Number DE81025686, Distribution Category STD -85
ANL-		
81-12	6:26111	NTIS, PC A03/MF A01. Order Number DE81024481, Distribution Category STD -11
ANL/CEN/FE-		
80-24	6:25436	NTIS, PC A06/MF A01. Order Number DE81024482, Distribution Category STD -90e
ANL/CNSV-		
10	6:25038	NTIS, PC A08/MF A01. Order Number DE81024484, Distribution Category STD -95f
ANL/CNSV-TM-		
60	6:25199	NTIS, PC A23/MF A01. Order Number DE81024488, Distribution Category MN -95e
60	6:25200	NTIS, PC A23/MF A01
60	6:25201	NTIS, PC A23/MF A01
60	6:25202	NTIS, PC A23/MF A01
60	6:25203	NTIS, PC A23/MF A01
60	6:25204	NTIS, PC A23/MF A01
60	6:25437	NTIS, PC A23/MF A01
60	6:25629	NTIS, PC A23/MF A01
60	6:25630	NTIS, PC A23/MF A01
60	6:25824	NTIS, PC A23/MF A01
60	6:25825	NTIS, PC A23/MF A01
60	6:25826	NTIS, PC A23/MF A01
60	6:25827	NTIS, PC A23/MF A01
60	6:25828	NTIS, PC A23/MF A01
60	6:25829	NTIS, PC A23/MF A01
60	6:25830	NTIS, PC A23/MF A01
60	6:25831	NTIS, PC A23/MF A01
60	6:25832	NTIS, PC A23/MF A01
60	6:25833	NTIS, PC A23/MF A01
60	6:26054	NTIS, PC A23/MF A01
60	6:26055	NTIS, PC A23/MF A01
60	6:26056	NTIS, PC A23/MF A01
60	6:26057	NTIS, PC A23/MF A01
60	6:26058	NTIS, PC A23/MF A01
60	6:26059	NTIS, PC A23/MF A01
60	6:26300	NTIS, PC A23/MF A01
60	6:26301	NTIS, PC A23/MF A01
ANL/EES-TM-		
139	6:24945	NTIS, PC A05/MF A01. Distribution Category MN -90b
140	6:25229	NTIS, PC A05/MF A01. Distribution Category MN -58b
ANL/ES-		
109	6:26296	NTIS, PC A09/MF A01. Order Number DE81025030, Distribution Category MN -11
ANL-HEP-		
80-77	6:26559	NTIS, PC A02/MF A01. Order Number DE81024461, Distribution Category MN -34D
ANL-HEP-CP-		
80-69	6:26518	NTIS, PC A02/MF A01. Order Number DE81024457, Distribution Category MN -34D
80-75	6:26519	NTIS, PC A02/MF A01. Order Number DE81024458, Distribution Category MN -34D
ANL-K-		
81-74	6:25322	NTIS, PC A05/MF A01. Order Number DE81024455, Distribution Category MN -59c
ANL/LRP-		
10	6:26297	NTIS, PC A08/MF A01. Order Number DE81025033, Distribution Category STD -88
ANL/MHD-		
80-19	6:25645	NTIS, PC A05/MF A01. Distribution Category STD -90g
ANL/MSD/FE-		
81-1	6:25934	NTIS, PC A03/MF A01. Order Number DE81024480, Distribution Category STD -90h
ANL/OEPM-		
80-8	6:25583	NTIS, PC A05/MF A01. Distribution Category STD -94cd
ASTM-STP-		
660	6:25677	$39.50
660	6:25678	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 7-29(1978)
660	6:25679	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 30-49(1978)
660	6:25680	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 82-103(1978)
660	6:25681	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 104-129(1978)
660	6:25682	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 130-144(1978)
660	6:25683	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 147-153(1978)
660	6:25684	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 154-171(1978)
660	6:25685	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 172-185(1978)

Report No.	*Abstract No.*	*Availability*
660	6:25686	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 186-199(1978)
660	6:25687	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 234-260(1978)
660	6:25688	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 263-280(1978)
660	6:25689	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 281-292(1978)
660	6:25749	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 60-70(1978)
660	6:25750	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 73-81(1978)
660	6:25751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 203-210(1978)
660	6:25752	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 211-233(1978)
660	6:25753	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 329-341(1978)
660	6:25759	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 50-59(1978)
660	81:25760	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 293-309(1978)
660	6:25761	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 342-356(1978)
660	6:25762	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 357-373(1978)
ATR-		
80(7747) -1(Vol.1)	6:25224	NTIS, PC A04/MF A01. Order Number DE81024305, Distribution Category MN -62d
80(7747) -1(Vol.2)	6:25225	NTIS, PC A07/MF A01. Order Number DE81024047, Distribution Category MN -62d
BAW-		
1662	6:25308	*See* SAND-80-8190
BDX-		
613-2449	6:25471	NTIS, PC A04/MF A01. Order Number DE81025631, Distribution Category MN -38
613-2565	6:25944	NTIS, PC A03/MF A01. Order Number DE81023773, Distribution Category MN -25
613-2582	6:26013	NTIS, PC A09/MF A01. Order Number DE81025605, Distribution Category MN -38
613-2594	6:26014	NTIS, PC A05/MF A01. Order Number DE81025609, Distribution Category MN -38
613-2625	6:26044	NTIS, PC A03/MF A01. Order Number DE81025520, Distribution Category MN -38
613-2626	6:26049	NTIS, PC A02/MF A01. Order Number DE81025607, Distribution Category MN -25
613-2629	6:26050	NTIS, PC A02/MF A01. Order Number DE81025608, Distribution Category MN -25
613-2634	6:26015	NTIS, PC A10/MF A01. Order Number DE81024453, Distribution Category MN -38
613-2635	6:26016	NTIS, PC A06/MF A01. Order Number DE81024463, Distribution Category MN -38
BNL-		
28332	6:26608	NTIS, PC A02/MF A01. Order Number DE81025095, Distribution Category MN -34
29282	6:25834	NTIS, PC A02/MF A01. Distribution Category MN -95c
29358	6:25517	NTIS, PC A02/MF A01. Distribution Category MN -78
29433	6:26331	NTIS, PC A02/MF A01. Distribution Category MN -11
29526	6:26112	NTIS, PC A03/MF A01. Order Number DE81025077, Distribution Category MN -11
29548	6:26566	NTIS, PC A02/MF A01. Order Number DE81025076, Distribution Category MN -34
29588	6:26066	NTIS, PC A03/MF A01. Distribution Category MN -28
29658	6:26583	NTIS, PC A02/MF A01. Order Number DE81025094, Distribution Category MN -4
29741	6:26113	NTIS, PC A03/MF A01. Order Number DE81025117, Distribution Category MN -11
51230	6:25389	NTIS, PC A05/MF A01. Order Number DE81025148, Distribution Category STD -94
51289	6:26114	NTIS, PC A03/MF A01. Order Number DE81023979, Distribution Category STD -13
51299	6:25690	NTIS, PC A07/MF A01. Order Number DE81023856, Distribution Category STD -95d
51326	6:25637	NTIS, PC A03/MF A01. Distribution Category STD -97b
51329	6:25452	NTIS, PC A06/MF A01. Order Number DE81026045, Distribution Category STD -97a
51359	6:25626	NTIS, PC A03/MF A01. Order Number DE81023858, Distribution Category STD -95c
51385	6:26104	NTIS, PC A02/MF A01. Order Number DE81023870, Distribution Category STD -11
51386	6:26105	NTIS, PC A02/MF A01. Order Number DE81023857, Distribution Category STD -11
BNL-NCS-		
51360	6:26595	NTIS, PC A03/MF A01. Order Number DE81023980, Distribution Category STD -34C
CONF-770936-		(ASTM symposium on heat transmission measurements, Philadelphia, PA, USA, 19-20 Sep 1977)
	6:25677	$39.50
	6:25678	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 7-29(1978)
	6:25679	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 30-49(1978)
	6:25680	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 82-103(1978)
	6:25681	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 104-129(1978)
	6:25682	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 130-144(1978)
	6:25683	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 147-153(1978)
	6:25684	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 154-171(1978)
	6:25685	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 172-185(1978)
	6:25686	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 186-199(1978)
	6:25687	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 234-260(1978)
	6:25688	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 263-280(1978)
	6:25689	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 281-292(1978)
	6:25749	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 60-70(1978)
	6:25750	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 73-81(1978)
	6:25751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 203-210(1978)
	6:25752	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 211-233(1978)

Report No.	Abstract No.	Availability
	6:25753	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 329-341(1978)
	6:25759	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 50-59(1978)
	6:25760	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 293-309(1978)
	6:25761	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 342-356(1978)
	6:25762	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 660, 357-373(1978)
CONF-780719-	(Conference of the American Society for Testing and Materials, Johnson, VT, USA, 9 Jul 1978,-14 Jul 1978/REPLACES CONF-780745)	
	6:25976	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 698, 257-269(1980)
	6:26168	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 698, 289-293(1980)
	6:26292	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 698, 75-83(1980)
CONF-781101-	(Symposium on the Savannah River Ecology Laboratory, Augusta, GA, USA, 8-11 Nov 1978)	
	6:26212	NTIS, PC A99/MF A01
CONF-790203-	(Solar energy symposium, Tokyo, Japan, 5-10 Feb 1979)	
	6:25216	NTIS (US Sales Only), PC A25/MF A01. Distribution Category MN -59
	6:25323	NTIS (US Sales Only), PC A25/MF A01
	6:25378	NTIS (US Sales Only), PC A25/MF A01
	6:25577	NTIS (US Sales Only), PC A25/MF A01
CONF-7903153-	(Atomic Industrial Forum fuel cycle conference, Atlanta, GA, USA, 11-14 Mar 1979)	
	6:25103	Bethesda, MD; At Ind Forum Inc (1979).
CONF-790415-	(177. national meeting of the American Chemical Society, Honolulu, HI, USA, 1-6 Apr 1979)	
P8	6:25186	ACS Symp. Ser., No. 144, 351-375(1981)
P8	6:25280	Washington, DC; American Chemical Society (1981).
P8	6:25281	ACS Symp. Ser., No. 144, 21-48(1981)
P8	6:25282	ACS Symp. Ser., No. 144, 49-76(1981)
P8	6:25283	ACS Symp. Ser., No. 144, 77-98(1981)
P8	6:25284	ACS Symp. Ser., No. 144, 137-162(1981)
P8	6:25285	ACS Symp. Ser., No. 144, 495-544(1981)
P8	6:25644	ACS Symp. Ser., No. 144, 3-17(1981)
CONF-790509-	(26. international technical communication conference, Los Angeles, CA, USA, 16-19 May 1979)	
3	6:26714	*See* UCRL-86304
CONF-790917-	(American Chemical Society national meeting, Washington, DC, USA, 10-14 Sep 1979)	
P5	6:25183	Washington, DC; America Chemical Society (1980).
P5	6:25188	ACS Symp. Ser., No. 130, 573-586(1980)
P5	6:25189	ACS Symp. Ser., No. 130, 587-601(1980)
P5	6:25205	ACS Symp. Ser., No. 130, 109-123(1980)
P5	6:25206	ACS Symp. Ser., No. 130, 169-177(1980)
P5	6:25290	ACS Symp. Ser., No. 130, 13-26(1980)
P5	6:25291	ACS Symp. Ser., No. 130, 29-42(1980)
P5	6:25292	ACS Symp. Ser., No. 130, 43-56(1980)
P5	6:25845	ACS Symp. Ser., No. 130, 1-12(1980)
P5	6:25846	ACS Symp. Ser., No. 130, 59-66(1980)
CONF-7909198-	(International trade fair on recycling, refuse collection and waste treatment, Jonkoping, Sweden, 17-21 Sep 1979)	
	6:25180	NTIS (US Sales Only), PC A99/MF A01
	6:25835	NTIS (US Sales Only), PC A99/MF A01. Distribution Category MN -69
	6:25836	NTIS (US Sales Only), PC A99/MF A01
CONF-791024-	(Solar industrial process heat conference, San Francisco, CA, USA, 31 Oct-2 Nov 1979)	
15	6:25348	*See* SERI/TP-353-467
CONF-791072-	(2. symposium on biotechnology in energy production and conservation, Gatlinburg, TN, USA, 3-5 Oct 1979)	
	6:25288	Biotechnol. Bioeng. Symp., No. 10, 189-197(1980)
CONF-7910103-	(Workshop on the production of new particles in super high energy collisions, Madison, WI, USA, 22-24 Oct 1979)	
	6:26481	Madison, WI; University of Wisconsin (1979).
CONF-7910117-	(Coal conference and EXPO V, Louisville, KY, USA, 23-25 Oct 1979)	
	6:24897	Pap. Symp. Manage., 74-87(1979)
CONF-7910214-	(International energy management conference, Birmingham, UK, 9-11 Oct 1979)	
	6:25625	NTIS (US Sales Only), PC A25/MF A01
	6:25674	NTIS (US Sales Only), PC A25/MF A01. Distribution Category MN -95
	6:25675	NTIS (US Sales Only), PC A25/MF A01
	6:25676	NTIS (US Sales Only), PC A25/MF A01
	6:25712	NTIS (US Sales Only), PC A25/MF A01
	6:25713	NTIS (US Sales Only), PC A25/MF A01
	6:25714	NTIS (US Sales Only), PC A25/MF A01
	6:25715	NTIS (US Sales Only), PC A25/MF A01
	6:25716	NTIS (US Sales Only), PC A25/MF A01
	6:25783	NTIS (US Sales Only), PC A25/MF A01
	6:25784	NTIS (US Sales Only), PC A25/MF A01
	6:25785	NTIS (US Sales Only), PC A25/MF A01
	6:25786	NTIS (US Sales Only), PC A25/MF A01
	6:25787	NTIS (US Sales Only), PC A25/MF A01
	6:25788	NTIS (US Sales Only), PC A25/MF A01
	6:25789	NTIS (US Sales Only), PC A25/MF A01
	6:25790	NTIS (US Sales Only), PC A25/MF A01
	6:25791	NTIS (US Sales Only), PC A25/MF A01
	6:25792	NTIS (US Sales Only), PC A25/MF A01
	6:25793	NTIS (US Sales Only), PC A25/MF A01
	6:25794	NTIS (US Sales Only), PC A25/MF A01
	6:25847	NTIS (US Sales Only), PC A25/MF A01
	6:25848	NTIS (US Sales Only), PC A25/MF A01
CONF-800265-	(Agri-energy roundtable conference, New Orleans, LA, USA, 7-9 Feb 1980)	
(Exc.)	6:25289	Washington, DC; Agri-Energy Roundtable, Inc. (1980).
CONF-800272-	(2. Franco-American conference on industrial energy conservation, Washington, DC, USA, 13-15 Feb 1980)	
	6:25673	NTIS, PC A14/MF A01

Report No.	Abstract No.	Availability
	6:25763	NTIS, PC A14/MF A01. Order Number DE81023976, Distribution Category MN -95f
	6:25764	NTIS, PC A14/MF A01
	6:25765	NTIS, PC A14/MF A01
	6:25766	NTIS, PC A14/MF A01
	6:25767	NTIS, PC A14/MF A01
	6:25768	NTIS, PC A14/MF A01
	6:25769	NTIS, PC A14/MF A01
	6:25770	NTIS, PC A14/MF A01
	6:25771	NTIS, PC A14/MF A01
	6:25772	NTIS, PC A14/MF A01
	6:25773	NTIS, PC A14/MF A01
	6:25774	NTIS, PC A14/MF A01
	6:25775	NTIS, PC A14/MF A01
	6:25776	NTIS, PC A14/MF A01
	6:25777	NTIS, PC A14/MF A01
	6:25778	NTIS, PC A14/MF A01
	6:25779	NTIS, PC A14/MF A01
	6:25780	NTIS, PC A14/MF A01
	6:25781	NTIS, PC A14/MF A01
	6:25782	NTIS, PC A14/MF A01
CONF-800277-	(Building energy performance standards conference, Boston, MA, USA, 21 Feb 1980)	
	6:25691	NTIS, PC A11/MF A01. Order Number DE81021782, Distribution Category MN -95d
CONF-800344-	(3. invitational well testing symposium, Oakland, CA, USA, 26-28 Mar 1980)	
	6:25401	*See* LBL-12076
	6:25402	*See* LBL-12076
	6:26096	*See* LBL-12076
	6:26404	*See* LBL-12076
	6:26405	*See* LBL-12076
	6:26406	*See* LBL-12076
	6:26407	*See* LBL-12076
	6:26408	*See* LBL-12076
	6:26409	*See* LBL-12076
	6:26410	*See* LBL-12076
	6:26411	*See* LBL-12076
	6:26412	*See* LBL-12076
	6:26413	*See* LBL-12076
	6:26414	*See* LBL-12076
	6:26415	*See* LBL-12076
	6:26428	*See* LBL-12076
CONF-800365-	(International conference on the ecological impact of acid precipitation, Sandefjord, Norway, 11-14 Mar 1980)	
	6:26115	NTIS, PC A17/MF A01
	6:26116	NTIS, PC A17/MF A01
	6:26117	NTIS, PC A17/MF A01
	6:26118	NTIS, PC A17/MF A01
	6:26119	NTIS, PC A17/MF A01
	6:26120	NTIS, PC A17/MF A01
	6:26121	NTIS, PC A17/MF A01
	6:26122	NTIS, PC A17/MF A01
	6:26123	NTIS, PC A17/MF A01
	6:26124	NTIS, PC A17/MF A01
	6:26125	NTIS, PC A17/MF A01
	6:26126	NTIS, PC A17/MF A01
	6:26127	NTIS, PC A17/MF A01
	6:26128	NTIS, PC A17/MF A01
	6:26129	NTIS, PC A17/MF A01
	6:26130	NTIS, PC A17/MF A01
	6:26131	NTIS, PC A17/MF A01
	6:26132	NTIS, PC A17/MF A01
	6:26133	NTIS, PC A17/MF A01
	6:26134	NTIS, PC A17/MF A01
	6:26135	NTIS, PC A17/MF A01
	6:26136	NTIS, PC A17/MF A01
	6:26137	NTIS, PC A17/MF A01
	6:26138	NTIS, PC A17/MF A01
	6:26139	NTIS, PC A17/MF A01
	6:26140	NTIS, PC A17/MF A01
	6:26141	NTIS, PC A17/MF A01
	6:26181	NTIS, PC A17/MF A01
	6:26182	NTIS, PC A17/MF A01
	6:26183	NTIS, PC A17/MF A01
	6:26184	NTIS, PC A17/MF A01
	6:26185	NTIS, PC A17/MF A01
	6:26186	NTIS, PC A17/MF A01
	6:26187	NTIS, PC A17/MF A01
	6:26188	NTIS, PC A17/MF A01
	6:26189	NTIS, PC A17/MF A01
	6:26190	NTIS, PC A17/MF A01
	6:26201	NTIS, PC A17/MF A01
	6:26204	NTIS, PC A17/MF A01
	6:26205	NTIS, PC A17/MF A01
	6:26206	NTIS, PC A17/MF A01
	6:26248	NTIS, PC A17/MF A01
	6:26249	NTIS, PC A17/MF A01
	6:26250	NTIS, PC A17/MF A01
	6:26251	NTIS, PC A17/MF A01
	6:26252	NTIS, PC A17/MF A01
	6:26253	NTIS, PC A17/MF A01
	6:26254	NTIS, PC A17/MF A01
	6:26255	NTIS, PC A17/MF A01
	6:26256	NTIS, PC A17/MF A01
	6:26257	NTIS, PC A17/MF A01
	6:26258	NTIS, PC A17/MF A01
	6:26259	NTIS, PC A17/MF A01
	6:26260	NTIS, PC A17/MF A01
	6:26261	NTIS, PC A17/MF A01
	6:26262	NTIS, PC A17/MF A01
	6:26263	NTIS, PC A17/MF A01
	6:26264	NTIS, PC A17/MF A01
	6:26265	NTIS, PC A17/MF A01
	6:26266	NTIS, PC A17/MF A01
	6:26267	NTIS, PC A17/MF A01
	6:26268	NTIS, PC A17/MF A01
	6:26269	NTIS, PC A17/MF A01
	6:26270	NTIS, PC A17/MF A01
	6:26271	NTIS, PC A17/MF A01
	6:26272	NTIS, PC A17/MF A01
	6:26273	NTIS, PC A17/MF A01
	6:26274	NTIS, PC A17/MF A01
	6:26275	NTIS, PC A17/MF A01
	6:26276	NTIS, PC A17/MF A01
	6:26277	NTIS, PC A17/MF A01
	6:26278	NTIS, PC A17/MF A01
	6:26279	NTIS, PC A17/MF A01
	6:26280	NTIS, PC A17/MF A01
	6:26281	NTIS, PC A17/MF A01
	6:26282	NTIS, PC A17/MF A01
	6:26283	NTIS, PC A17/MF A01
	6:26284	NTIS, PC A17/MF A01
	6:26285	NTIS, PC A17/MF A01
	6:26332	NTIS, PC A17/MF A01. Distribution Category MN -11
	6:26333	NTIS, PC A17/MF A01
	6:26334	NTIS, PC A17/MF A01
	6:26335	NTIS, PC A17/MF A01
	6:26336	NTIS, PC A17/MF A01
	6:26337	NTIS, PC A17/MF A01
	6:26338	NTIS, PC A17/MF A01
	6:26339	NTIS, PC A17/MF A01
	6:26340	NTIS, PC A17/MF A01
	6:26341	NTIS, PC A17/MF A01
	6:26342	NTIS, PC A17/MF A01
	6:26343	NTIS, PC A17/MF A01
	6:26344	NTIS, PC A17/MF A01
	6:26345	NTIS, PC A17/MF A01
	6:26346	NTIS, PC A17/MF A01
	6:26347	NTIS, PC A17/MF A01
	6:26348	NTIS, PC A17/MF A01
	6:26349	NTIS, PC A17/MF A01
	6:26350	NTIS, PC A17/MF A01
	6:26351	NTIS, PC A17/MF A01
	6:26352	NTIS, PC A17/MF A01
	6:26353	NTIS, PC A17/MF A01
	6:26354	NTIS, PC A17/MF A01
	6:26355	NTIS, PC A17/MF A01
	6:26356	NTIS, PC A17/MF A01
	6:26357	NTIS, PC A17/MF A01
	6:26358	NTIS, PC A17/MF A01
	6:26359	NTIS, PC A17/MF A01
	6:26360	NTIS, PC A17/MF A01
	6:26361	NTIS, PC A17/MF A01
	6:26362	NTIS, PC A17/MF A01
	6:26363	NTIS, PC A17/MF A01
	6:26364	NTIS, PC A17/MF A01
	6:26365	NTIS, PC A17/MF A01
	6:26366	NTIS, PC A17/MF A01
	6:26367	NTIS, PC A17/MF A01
	6:26368	NTIS, PC A17/MF A01
	6:26369	NTIS, PC A17/MF A01
	6:26370	NTIS, PC A17/MF A01
	6:26371	NTIS, PC A17/MF A01
	6:26372	NTIS, PC A17/MF A01
	6:26373	NTIS, PC A17/MF A01
	6:26374	NTIS, PC A17/MF A01
	6:26375	NTIS, PC A17/MF A01

Report No.	Abstract No.	Availability
	6:26376	NTIS, PC A17/MF A01
	6:26377	NTIS, PC A17/MF A01
	6:26378	NTIS, PC A17/MF A01
	6:26379	NTIS, PC A17/MF A01
	6:26380	NTIS, PC A17/MF A01
	6:26381	NTIS, PC A17/MF A01
	6:26382	NTIS, PC A17/MF A01
	6:26383	NTIS, PC A17/MF A01
	6:26384	NTIS, PC A17/MF A01
	6:26385	NTIS, PC A17/MF A01
	6:26386	NTIS, PC A17/MF A01
	6:26387	NTIS, PC A17/MF A01
CONF-8003142-	(Pacific Coast Gas Association operating section transmission conference, Salt Lake City, UT, USA, 31 Mar-1 Apr 1980)	
1	6:26029	San Mateo, CA; Pacific Coast Gas Association (1980).
2	6:24944	San Mateo, CA; Pacific Coast Gas Association (1980).
3	6:26030	San Mateo, CA; Pacific Coast Gas Association (1980).
4	6:25077	San Mateo, CA; Pacific Coast Gas Association (1980).
7	6:25074	San Francisco, CA; Pacific Gas and Electric Company (1980).
CONF-800412-	(18. annual symposium on engineering geology and soils engineering, Boise, ID, USA, 2-4 Apr 1980)	
	6:26421	NTIS, PC A16/MF A01
CONF-800438-	(Earth sheltered housing conference and exhibition, Minneapolis, MN, USA, 9-11 Apr 1980)	
	6:25324	NTIS, PC A11/MF A01
	6:25325	NTIS, PC A11/MF A01
	6:25692	NTIS, PC A11/MF A01. Distribution Category MN -59
	6:25693	NTIS, PC A11/MF A01
	6:25694	NTIS, PC A11/MF A01
	6:25695	NTIS, PC A11/MF A01
	6:25696	NTIS, PC A11/MF A01
	6:25697	NTIS, PC A11/MF A01
	6:25698	NTIS, PC A11/MF A01
	6:25699	NTIS, PC A11/MF A01
	6:25700	NTIS, PC A11/MF A01
	6:25701	NTIS, PC A11/MF A01
	6:25702	NTIS, PC A11/MF A01
	6:25703	NTIS, PC A11/MF A01
	6:25704	NTIS, PC A11/MF A01
	6:25705	NTIS, PC A11/MF A01
	6:25706	NTIS, PC A11/MF A01
	6:25707	NTIS, PC A11/MF A01
	6:25708	NTIS, PC A11/MF A01
	6:25709	NTIS, PC A11/MF A01
	6:26164	NTIS, PC A11/MF A01
	6:26194	NTIS, PC A11/MF A01
	6:26202	NTIS, PC A11/MF A01
CONF-800439-	(International conference on metallurgical coatings, San Diego, CA, USA, 21-25 Apr 1980)	
14	6:25904	*See* HEDL-SA-2137
CONF-800449-	(National technical conference - earth sheltered building design innovations, Oklahoma City, OK, USA, 18-19 Apr 1980)	
	6:25732	Stillwater, OK; Oklahoma State University (1980).
CONF-8004157-	(Conference on the Three Mile Island nuclear accident, New York, NY, USA, 8-10 Apr 1980)	
	6:25539	$66.00
CONF-8004161-	(Physics and chemistry of energy-related atmospheric pollution, Harpers Ferry, WV, USA, 21-23 Apr 1980)	
1	6:26450	NTIS, PC A02/MF A01. Order Number DE81023544, Distribution Category MN -34A
CONF-800517-	(26. annual technical meeting of the Institute for Environmental Sciences, Philadelphia, PA, USA, 11-14 May 1980)	
	6:25287	Proc. - Inst. Environ. Sci., 229-236(May 1980)
	6:25321	Proc. - Inst. Environ. Sci., 420-426(May 1980)
CONF-800561-	(International conference on ordering in two dimensions, Lake Geneva, WI, USA, 28-30 May 1980)	
4	6:26618	NTIS, PC A02/MF A01. Order Number DE81023540, Distribution Category MN -34
CONF-8005173-	(National research council diesel impacts study committee meeting, Los Angeles, CA, USA, 5-7 May 1980)	
1	6:26148	*See* LBL-10881
CONF-8005175-	(American Chemical Society meeting, Portland, OR, USA, 15 May 1980)	
1	6:25137	*See* RHO-BWI-SA-64
CONF-800608-	(Air Pollution Control Association annual meeting, Montreal, Canada, Jun 1980)	
7	6:26063	NTIS, PC A02/MF A01. Distribution Category MN -11
8	6:25638	NTIS, PC A02/MF A01. Distribution Category MN -90i
CONF-800609-	(10. international symposium on effects of radiation on materials, Savannah, GA, USA, 3-5 Jun 1980)	
17	6:25488	NTIS, PC A03/MF A01. Distribution Category MN -79h
CONF-800612-	(29. power sources conference, Atlantic City, NJ, USA, 9-12 Jun 1980)	
6	6:25584	NTIS, PC A03/MF A01. Order Number DE81023572, Distribution Category MN -94c
CONF-800616-	(3. world hydrogen energy conference, Tokyo, Japan, 23-26 Jun 1980)	
10	6:25176	NTIS, PC A02/MF A01. Order Number DE81023573, Distribution Category MN -4
CONF-800617-	(7. international conference on MHD electrical power generation, Cambridge, MA, USA, 16-20 Jun 1980)	
8	6:25646	NTIS, PC A02/MF A01. Order Number DE81023545, Distribution Category MN -93
CONF-800626-	(6. international conference on vacuum ultraviolet radiation physics, Charlottesville, VA, USA, 2-6 Jun 1980)	
8	6:26447	NTIS, PC A02/MF A01. Order Number DE81023546, Distribution Category MN -34A
CONF-800631-	(8. international cryogenic engineering conference, Genoa, Italy, 3-6 Jun 1980)	
10	6:25647	NTIS, PC A02/MF A01. Order Number DE81023520, Distribution Category MN -90g
CONF-800633-	(7. ocean energy conference, Washington, DC, USA, 2-5 Jun 1980)	
5	6:25319	*See* LBL-11833
CONF-8006123-	(5. tandem conference, Catania, Italy, 9-12 Jun 1980)	
2	6:26070	NTIS, PC A04/MF A01. Order Number DE81023522, Distribution Category MN -28
3	6:26064	NTIS, PC A02/MF A01. Order Number DE81023521, Distribution Category MN -28
CONF-8006130-	(Advanced study institute on metal hydrides, Rhodes, Greece, 17-27 Jun 1980)	
3	6:25900	NTIS, PC A03/MF A01. Distribution Category MN -25
CONF-8006156-	(Basic research needs and opportunities on interfaces and solar materials, Denver, CO, USA, 30 Jun-3 Jul 1980)	
	6:25232	NTIS, PC A11/MF A01. Distribution Category STD -25
	6:25233	NTIS, PC A11/MF A01
	6:25234	NTIS, PC A11/MF A01
	6:25235	NTIS, PC A11/MF A01
	6:25236	NTIS, PC A11/MF A01
	6:25237	NTIS, PC A11/MF A01
	6:25238	NTIS, PC A11/MF A01
	6:25239	NTIS, PC A11/MF A01
	6:25240	NTIS, PC A11/MF A01
	6:25241	NTIS, PC A11/MF A01
	6:25242	NTIS, PC A11/MF A01
	6:25243	NTIS, PC A11/MF A01
	6:25244	NTIS, PC A11/MF A01
	6:25245	NTIS, PC A11/MF A01
	6:25246	NTIS, PC A11/MF A01
	6:25247	NTIS, PC A11/MF A01
1	6:25979	*See* IS-M-316
CONF-8006171-	(International conference on water pollution research, Toronto, Canada, 23-27 Jun 1980)	
1	6:24924	NTIS, PC A02/MF A01. Order Number DE81023574, Distribution Category MN -90c

Report No.	*Abstract No.*	*Availability*
2	6:24925	NTIS, PC A02/MF A01. Order Number DE81023575, Distribution Category MN -90c
CONF-800707-	(8. international conference on plasma physics and controlled nuclear fusion research, Brussels, Belgium, 1-10 Jul 1980)	
26	6:26667	NTIS, PC A02/MF A01. Order Number DE81023528, Distribution Category MN -20d
CONF-800723-	(19. national heat transfer conference, Orlando, FL, USA, 27-30 Jul 1980)	
26	6:25518	NTIS, PC A02/MF A01. Order Number DE81023542, Distribution Category MN -79k
27	6:25519	NTIS, PC A02/MF A01. Order Number DE81023531, Distribution Category MN -79k
CONF-800724-	(20. international conference on high energy physics, Madison, WI, USA, 17-23 Jul 1980)	
	6:26492	AIP Conf. Proc., 68: No. 1, 2-4(Feb 1981)
	6:26493	AIP Conf. Proc., 68: No. 1, 5-7(Feb 1981)
	6:26494	AIP Conf. Proc., 68: No. 1, 11-14(Feb 1981)
	6:26495	AIP Conf. Proc., 68: No. 1, 18-20(Feb 1981)
	6:26496	AIP Conf. Proc., 68: No. 1, 44-45(Feb 1981)
	6:26497	AIP Conf. Proc., 68: No. 1, 137-139(Feb 1981)
	6:26498	AIP Conf. Proc., 68: No. 1, 158-160(Feb 1981)
	6:26499	AIP Conf. Proc., 68: No. 1, 190-191(Feb 1981)
	6:26500	AIP Conf. Proc., 68: No. 1, 212-219(Feb 1981)
	6:26501	AIP Conf. Proc., 68: No. 1, 220(Feb 1981)
	6:26502	AIP Conf. Proc., 68: No. 1, 318-321(Feb 1981)
	6:26503	AIP Conf. Proc., 68: No. 1, 334-340(Feb 1981)
	6:26504	AIP Conf. Proc., 68: No. 1, 348-351(Feb 1981)
	6:26505	AIP Conf. Proc., 68: No. 1, 364-367(Feb 1981)
	6:26506	AIP Conf. Proc., 68: No. 1, 368-372(Feb 1981)
	6:26507	AIP Conf. Proc., 68: No. 1, 373-379(Feb 1981)
	6:26508	AIP Conf. Proc., 68: No. 1, 380-384(Feb 1981)
	6:26509	AIP Conf. Proc., 68: No. 1, 537-538(Feb 1981)
	6:26510	AIP Conf. Proc., 68: No. 1, 540-545(Feb 1981)
	6:26511	AIP Conf. Proc., 68: No. 1, 550(Feb 1981)
	6:26512	AIP Conf. Proc., 68: No. 1, 573-575(Feb 1981)
	6:26513	AIP Conf. Proc., 68: No. 1, 604-614(Feb 1981)
	6:26514	AIP Conf. Proc., 68: No. 1, 668-674(Feb 1981)
	6:26515	AIP Conf. Proc., 68: No. 1, 700-704(Feb 1981)
	6:26516	AIP Conf. Proc., 68: No. 1, 705-711(Feb 1981)
	6:26517	AIP Conf. Proc., 68: No. 1, 741-745(Feb 1981)
	6:26530	AIP Conf. Proc., 68: No. 1, 59(Feb 1981)
	6:26531	AIP Conf. Proc., 68: No. 1, 80-83(Feb 1981)
	6:26532	AIP Conf. Proc., 68: No. 1, 114-117(Feb 1981)
	6:26533	AIP Conf. Proc., 68: No. 1, 118-122(Feb 1981)
	6:26534	AIP Conf. Proc., 68: No. 1, 263-267(Feb 1981)
	6:26535	AIP Conf. Proc., 68: No. 1, 271-272(Feb 1981)
	6:26536	AIP Conf. Proc., 68: No. 1, 273-276(Feb 1981)
	6:26537	AIP Conf. Proc., 68: No. 1, 296-301(Feb 1981)
	6:26538	AIP Conf. Proc., 68: No. 1, 386-389(Feb 1981)
	6:26539	AIP Conf. Proc., 68: No. 1, 390-395(Feb 1981)
	6:26540	AIP Conf. Proc., 68: No. 1, 422-426(Feb 1981)
	6:26541	AIP Conf. Proc., 68: No. 1, 427-430(Feb 1981)
	6:26542	AIP Conf. Proc., 68: No. 1, 445-450(Feb 1981)
	6:26543	AIP Conf. Proc., 68: No. 1, 455-459(Feb 1981)
	6:26544	AIP Conf. Proc., 68: No. 1, 483-487(Feb 1981)
	6:26545	AIP Conf. Proc., 68: No. 1, 489-492(Feb 1981)
	6:26546	AIP Conf. Proc., 68: No. 1, 505-508(Feb 1981)
	6:26547	AIP Conf. Proc., 68: No. 1, 510-516(Feb 1981)
	6:26548	AIP Conf. Proc., 68: No. 1, 568-572(Feb 1981)
	6:26549	AIP Conf. Proc., 68: No. 1, 639-643(Feb 1981)
	6:26550	AIP Conf. Proc., 68: No. 1, 719-724(Feb 1981)
	6:26551	AIP Conf. Proc., 68: No. 1, 725-727(Feb 1981)
	6:26552	AIP Conf. Proc., 68: No. 1, 785-796(Feb 1981)
	6:26553	AIP Conf. Proc., 68: No. 1, 805-809(Feb 1981)
	6:26560	AIP Conf. Proc., 68: No. 1, 322-325(Feb 1981)
	6:26561	AIP Conf. Proc., 68: No. 1, 398-403(Feb 1981)
	6:26562	AIP Conf. Proc., 68: No. 1, 460-462(Feb 1981)
	6:26563	AIP Conf. Proc., 68: No. 1, 517-523(Feb 1981)
CONF-800726-	(MCHF workshop, College Station, TX, USA, 14-16 Jul 1980)	
2	6:26448	NTIS, PC A02/MF A01. Order Number DE81023539, Distribution Category MN -34A
CONF-800740-	(11. international conference on high energy accelerators, Geneva, Switzerland, 7-11 Jul 1980)	
28	6:26668	NTIS, PC A02/MF A01. Order Number DE81023529, Distribution Category MN -21
CONF-800765-	(7. LLR/MMRD international symposium of interfaces in glass-metal systems, Berkeley, CA, USA, 28 Jul-1 Aug 1980)	
9	6:26613	NTIS, PC A02/MF A01. Order Number DE81023113, Distribution Category MN -34
10	6:25935	NTIS, PC A02/MF A01. Order Number DE81023125, Distribution Category MN -25
CONF-8007101-	(International Solar Energy Society conference on European community solar housing, London. UK, Jul 1980)	
	6:25368	London, England; International Solar Energy Society (1980).
CONF-8007106-	(5. conference on automated deduction, Savoi, France, 8-11 Jul 1980)	
1	6:26626	NTIS, PC A02/MF A01. Order Number DE81023533, Distribution Category MN -32
CONF-800804-	(ASME century 2 emerging technology conference, San Francisco, CA, USA, 10-22 Aug 1980)	
39	6:25379	NTIS, PC A02/MF A01. Order Number DE81023115, Distribution Category MN -59c
40	6:25326	NTIS, PC A02/MF A01. Order Number DE81023122, Distribution Category MN -59c
41	6:25639	NTIS, PC A02/MF A01. Order Number DE81023121, Distribution Category MN -95

Report No.	Abstract No.	Availability
CONF-800806-	(15. intersociety energy conversion engineering conference, Seattle, WA, USA, 18-22 Aug 1980)	
42	6:25648	NTIS, PC A02/MF A01. Order Number DE81023120, Distribution Category MN -93
43	6:25649	NTIS, PC A02/MF A01. Order Number DE81023119, Distribution Category MN -93
44	6:24955	NTIS, PC A02/MF A01. Order Number DE81023123, Distribution Category MN -90e
45	6:24956	NTIS, PC A02/MF A01. Order Number DE81023124, Distribution Category MN -90e
46	6:25585	NTIS, PC A03/MF A01. Order Number DE81023127, Distribution Category MN -94cb
CONF-8008109-	(Business and economic statistical conference, Washington, DC, USA, 11-15 Aug 1980)	
1	6:26402	NTIS, PC A02/MF A01. Order Number DE81023103, Distribution Category MN -41
CONF-8008117-	(Workshop on applications of fireside additives to utility boilers, Boston, MA, USA, 3-4 Aug 1980)	
	6:24958	*See* EPRI-WS-80-127
	6:24959	*See* EPRI-WS-80-127
	6:24960	*See* EPRI-WS-80-127
	6:24961	*See* EPRI-WS-80-127
	6:24962	*See* EPRI-WS-80-127
	6:24963	*See* EPRI-WS-80-127
	6:25061	*See* EPRI-WS-80-127
	6:25062	*See* EPRI-WS-80-127
	6:25063	*See* EPRI-WS-80-127
	6:25064	*See* EPRI-WS-80-127
	6:25065	*See* EPRI-WS-80-127
	6:25446	*See* EPRI-WS-80-127
	6:25447	*See* EPRI-WS-80-127
	6:25455	*See* EPRI-WS-80-127
	6:25456	*See* EPRI-WS-80-127
	6:25457	*See* EPRI-WS-80-127
	6:25458	*See* EPRI-WS-80-127
CONF-800931-	(55. Society of Petroleum Engineers of AIME annual technical conference and exhibition, Dallas, TX, USA, 21-24 Sep 1980)	
	6:25036	Soc. Pet. Eng. AIME, Pap., No. 9430, vp(1980)
CONF-800939-	(International congress on transportation, Dearborn, MI, USA, 15-17 Sep 1980)	
2	6:25878	NTIS, PC A02/MF A01. Order Number DE81023833, Distribution Category MN -96
CONF-800950-	(11. symposium on fusion technology, Oxford, UK, 15-19 Sep 1980)	
20	6:26669	NTIS, PC A02/MF A01. Order Number DE81023831, Distribution Category MN -20
CONF-800953-	(Annual meeting of the Fine Particle Society, Washington, DC, USA, 16-18 Sep 1980)	
2	6:26162	*See* UCRL-84878
CONF-800954-	(Ternary superconductors conference, Lake Geneva, WI, USA, 24-26 Sep 1980)	
4	6:25945	NTIS, PC A02/MF A01. Order Number DE81023879, Distribution Category MN -34
CONF-800963-	(5. international photosynthesis congress, Kassandra-Halkidiki, Greece, 7-13 Sep 1980)	
7	6:26307	NTIS, PC A02/MF A01. Order Number DE81023889, Distribution Category MN -48
CONF-800979-	(Workshop on nuclear data evaluation methods and procedures, Upton, NY, USA, 22-25 Sep 1980)	
18	6:26601	NTIS, PC A02/MF A01. Order Number DE81023896, Distribution Category MN -34C
19	6:26596	NTIS, PC A03/MF A01. Order Number DE81023897, Distribution Category MN -34C
CONF-800980-	(Applied superconductivity conference, Santa Fe, NM, USA, 29 Sep-2 Oct 1980)	
38	6:26017	NTIS, PC A02/MF A01. Order Number DE81023891, Distribution Category MN -25
39	6:26067	NTIS, PC A02/MF A01. Order Number DE81023922, Distribution Category MN -28
42	6:26068	NTIS, PC A02/MF A01. Order Number DE81023899, Distribution Category MN -28
CONF-800994-	(International symposium on H.E. physics with polarized beams and polarized targets, Lausanne, Switzerland, 25 Sep-1 Oct 1980)	
16	6:26559	*See* ANL-HEP-80-77
17	6:26518	*See* ANL-HEP-CP-80-69
18	6:26519	*See* ANL-HEP-CP-80-75
CONF-8009144-	(ASAE national energy symposium, Kansas City, MO, USA, 29 Sep-1 Oct 1980)	
(Vol.2)	6:25275	$27.50
(Vol.2)	6:25276	ASAE Publ., No. 4-81, 273-279(1981)
(Vol.2)	6:25277	ASAE Publ., No. 4-81, 349-356(1981)
(Vol.2)	6:25353	ASAE Publ., No. 4-81, 509-512(1981)
(Vol.2)	6:25354	ASAE Publ., No. 4-81, 513-523(1981)
(Vol.2)	6:25355	ASAE Publ., No. 4-81, 536-539(1981)
(Vol.2)	6:25356	ASAE Publ., No. 4-81, 540-544(1981)
(Vol.2)	6:25429	ASAE Publ., No. 4-81, 479-483(1981)
(Vol.2)	6:25430	ASAE Publ., No. 4-81, 484-488(1981)
(Vol.2)	6:25431	ASAE Publ., No. 4-81, 489-495(1981)
(Vol.2)	6:25432	ASAE Publ., No. 4-81, 496-500(1981)
(Vol.2)	6:25729	ASAE Publ., No. 4-81, 558-561(1981)
(Vol.2)	6:25808	ASAE Publ., No. 4-81, 456-460(1981)
(Vol.2)	6:25809	ASAE Publ., No. 4-81, 466-471(1981)
(Vol.2)	6:25810	ASAE Publ., No. 4-81, 472-478(1981)
(Vol.2)	6:25811	ASAE Publ., No. 4-81, 573-577(1981)
(Vol.2)	6:25893	ASAE Publ., No. 4-81, 324-329(1981)
(Vol.2)	6:25894	ASAE Publ., No. 4-81, 397-399(1981)
(Vol.3)	6:25357	ASAE Publ., No. 5-81, 581-585(1981)
(Vol.3)	6:25358	ASAE Publ., No. 5-81, 586-591(1981)
(Vol.3)	6:25359	ASAE Publ., No. 5-81, 640-644(1981)
(Vol.3)	6:25812	$9.50
(Vol.3)	6:25813	ASAE Publ., No. 5-81, 592-597(1981)
(Vol.3)	6:25814	ASAE Publ., No. 5-81, 598-602(1981)
(Vol.3)	6:25815	ASAE Publ., No. 5-81, 603-609(1981)
(Vol.3)	6:25816	ASAE Publ., No. 5-81, 610-613(1981)
(Vol.3)	6:25817	ASAE Publ., No. 5-81, 654-659(1981)
(Vol.3)	6:25818	ASAE Publ., No. 5-81, 660-664(1981)
CONF-801011-	(4. ANS topical meeting on the technology of controlled nuclear fusion, King of Prussia, PA, USA, 14-17 Oct 1980)	
85	6:26670	NTIS, PC A02/MF A01. Order Number DE81023917, Distribution Category MN -20b
86	6:26671	NTIS, PC A02/MF A01. Order Number DE81023717, Distribution Category MN -20d
87	6:26672	NTIS, PC A02/MF A01. Order Number DE81023716, Distribution Category MN -20c
88	6:26673	NTIS, PC A02/MF A01. Order Number DE81023910, Distribution Category MN -20d
89	6:26674	NTIS, PC A02/MF A01. Order Number DE81023708, Distribution Category MN -20a
90	6:26675	NTIS, PC A02/MF A01. Order Number DE81023919, Distribution Category MN -20d

Report No.	*Abstract No.*	*Availability*
91	6:26676	NTIS, PC A02/MF A01. Order Number DE81023719, Distribution Category MN -20d
92	6:26677	NTIS, PC A02/MF A01. Order Number DE81023904, Distribution Category MN -20d
93	6:26678	NTIS, PC A02/MF A01. Order Number DE81023712, Distribution Category MN -20
94	6:26679	NTIS, PC A02/MF A01. Order Number DE81023912, Distribution Category MN -20
95	6:26680	NTIS, PC A02/MF A01. Order Number DE81023915, Distribution Category MN -20d
96	6:26681	NTIS, PC A02/MF A01. Order Number DE81023843, Distribution Category MN -20a
97	6:26628	NTIS, PC A02/MF A01. Order Number DE81023845, Distribution Category MN -20a
98	6:26682	NTIS, PC A02/MF A01. Order Number DE81023914, Distribution Category MN -20d
99	6:26683	NTIS, PC A02/MF A01. Order Number DE81023913, Distribution Category MN -20d
100	6:26684	NTIS, PC A02/MF A01. Order Number DE81023911, Distribution Category MN -20d
101	6:26685	NTIS, PC A02/MF A01. Order Number DE81023849, Distribution Category MN -21
102	6:26705	*See* PPPL-1809
103	6:26686	NTIS, PC A02/MF A01. Order Number DE81023844, Distribution Category MN -20e
CONF-801038-	(16. DOE nuclear air cleaning conference, San Diego, CA, USA, 20-23 Oct 1980)	
23	6:25166	NTIS, PC A02/MF A01. Order Number DE81023817, Distribution Category MN -41
CONF-801061-	(Conference on high density penetration materials, Charlottesville, VA, USA, 28-30 Oct 1980)	
7	6:25916	*See* Y/DV-73
8	6:25917	*See* Y/DV-74
CONF-801063-	(International symposium on the impacts of radionuclide releases into the marine environment, Vienna, Austria, 6-10 Oct 1980)	
6	6:26291	NTIS, PC A02/MF A01. Order Number DE81023909, Distribution Category MN -11
CONF-8010105-	(Symposium on flue gas desulfurization, Houston, TX, USA, 28-31 Oct 1980)	
(Vol.2)	6:24926	*See* EPA/600/9-81-019B
(Vol.2)	6:24927	*See* EPA/600/9-81-019B
(Vol.2)	6:24928	*See* EPA/600/9-81-019B
(Vol.2)	6:25840	*See* EPA/600/9-81-019B
CONF-8010130-	(Waste-Rock Interactions Technology annual information meeting, Seattle, WA, USA, 13-15 Oct 1980)	
8	6:25164	NTIS, PC A02/MF A01. Order Number DE81023850, Distribution Category MN -70
CONF-8010159-	(Fall meeting of the Electrochemical Society, Hollywood, FL, USA, 5-10 Oct 1980)	
11	6:25587	NTIS, PC A02/MF A01. Order Number DE81023816, Distribution Category MN -94cb
CONF-8010190-	(Symposium on NDE, Pittsburgh, PA, USA, 5-9 Oct 1980)	
1	6:25906	*See* IS-M-315
CONF-801103-	(IEEE nuclear science symposium, Orlando, FL, USA, 5-7 Nov 1980)	
59	6:26076	NTIS, PC A02/MF A01. Order Number DE81023825, Distribution Category MN -41
CONF-801104-	(73. annual meeting of the American Institute of Chemical Engineers, Chicago, IL, USA, 12-16 Nov 1980)	
15	6:24867	*See* IS-M-318
16	6:24841	NTIS, PC A02/MF A01. Order Number DE81025019, Distribution Category MN -59b
CONF-801107-	(ANS international conference, Washington, DC, USA, 17-21 Nov 1980)	
72	6:25494	*See* HEDL-SA-2203-FP
CONF-801111-	(6. conference on application of accelerators in research and industry, Denton, TX, USA, Nov 1980)	
45	6:25175	NTIS, PC A02/MF A01. Order Number DE81023806, Distribution Category MN -28
46	6:26069	NTIS, PC A02/MF A01. Order Number DE81023802, Distribution Category MN -28
47	6:26577	NTIS, PC A02/MF A01. Order Number DE81023803, Distribution Category MN -34C
48	6:26591	NTIS, PC A02/MF A01. Order Number DE81023724, Distribution Category MN -34C
49	6:26449	NTIS, PC A02/MF A01. Order Number DE81023805, Distribution Category MN -34A
CONF-801124-	(3. annual meeting of the Materials Research Society, Boston, MA, USA, 17-20 Nov 1980)	
50	6:25895	NTIS, PC A02/MF A01. Order Number DE81023823, Distribution Category MN -25
CONF-801125-	(12. central regional meeting of the American Chemical Society, Pittsburgh, PA, USA, 12-14 Nov 1980)	
3	6:24866	*See* IS-M-317
CONF-801134-	(26. annual conference on magnetism and magnetic metals, Dallas, TX, USA, 11-14 Nov 1980)	
15	6:25896	NTIS, PC A02/MF A01. Order Number DE81023804, Distribution Category MN -34
16	6:25897	NTIS, PC A02/MF A01. Order Number DE81023801, Distribution Category MN -34
CONF-801142-	(3. international coal utilization exhibition and conference, Houston, TX, USA, 18-20 Nov 1980)	
(Vols.1and2)	6:24968	Coal Technology '80 Conference, 6006 Bellaire Blvd., Suite 100, Houston, TX, 77081
(Vols.3and4)	6:24949	Coal Technology '80 Conference, 6006 Bellaire Boulevard, Suite 100, Houston, TX 77081
(Vols.5and6)	6:24892	Coal Technology '80 Conference, 6006 Bellaire Boulevard, Suite 100, Houston, TX 77081
CONF-801148-	(ASTM conference on mechanical testing for deformation model development, Bal Harbour, FL, USA, 12-13 Nov 1980)	
6	6:25898	NTIS, PC A03/MF A01. Order Number DE81023839, Distribution Category MN -25
CONF-801155-	(3. annual symposium on uranium mill tailings management, Ft Collins, CO, USA, 24-25 Nov 1980)	
6	6:25163	NTIS, PC A02/MF A01. Distribution Category MN -11
CONF-801210-	(3. Miami international conference on alternative energy sources, Miami Beach, FL, USA, 15-17 Dec 1980)	
25	6:25604	NTIS, PC A02/MF A01. Order Number DE81023822, Distribution Category MN -11
26	6:25179	NTIS, PC A02/MF A01. Order Number DE81023819, Distribution Category MN -95e
27	6:25438	NTIS, PC A02/MF A01. Order Number DE81023818, Distribution Category MN -95
28	6:24933	*See* IS-M-309
CONF-801217-	(Symposium on modeling and low-level waste management, Denver, CO, USA, 1-4 Dec 1980)	
	6:25105	NTIS, PC A17/MF A01. Order Number DE81025085, Distribution Category MN -70
	6:25106	NTIS, PC A17/MF A01
	6:25107	NTIS, PC A17/MF A01
	6:25108	NTIS, PC A17/MF A01
	6:25109	NTIS, PC A17/MF A01
	6:25110	NTIS, PC A17/MF A01
	6:25111	NTIS, PC A17/MF A01
	6:25112	NTIS, PC A17/MF A01
	6:25113	NTIS, PC A17/MF A01

Report No.	Abstract No.	Availability
	6:25114	NTIS, PC A17/MF A01
	6:25115	NTIS, PC A17/MF A01
	6:25116	NTIS, PC A17/MF A01
	6:25117	NTIS, PC A17/MF A01
	6:25118	NTIS, PC A17/MF A01
	6:25167	NTIS, PC A17/MF A01
	6:25168	NTIS, PC A17/MF A01
	6:26286	NTIS, PC A17/MF A01
CONF-801234-	(American geophysical union special session, San Francisco, CA, USA, 7-12 Dec 1980)	
2	6:26429	*See* RHO-BWI-SA-67
CONF-801242-	(Electric and hybrid vehicle advanced technology seminar, Pasadena, CA, USA, 8-9 Dec 1980)	
7	6:25879	NTIS, PC A02/MF A01. Order Number DE81023820, Distribution Category MN -96
CONF-801263-	(Symposium on surface mining hydrology, sedimentology and reclamation, Lexington, KY, USA, 1-5 Dec 1980)	
1	6:24898	NTIS, PC A02/MF A01. Order Number DE81023810, Distribution Category MN -88
CONF-810107-	(2. international conference on recent progress in many-body theories, Mexico City, Mexico, 12-16 Jan 1981)	
5	6:26603	*See* IS-M-320
CONF-810141-	(Alternate fusion fuels workshop, Germantown, MD, USA, 26-27 Jan 1981)	
(Absts)	6:26687	NTIS, PC A03/MF A01. Order Number DE81024017, Distribution Category STD -20
CONF-810203-	(110. annual meeting of the AIME, Chicago, IL, USA, 22-26 Feb 1981)	
14	6:25907	*See* IS-M-319
CONF-810257-	(18. winter school of theoretical physics, Karpacz, Poland, 18 Feb-4 Mar 1981)	
1	6:26566	*See* BNL-29548
CONF-810258-	(International conference on prepared fuels and resource recovery technology, Nashville, TN, USA, 10-13 Feb 1981)	
	6:25199	*See* ANL/CNSV-TM-60
	6:25200	*See* ANL/CNSV-TM-60
	6:25201	*See* ANL/CNSV-TM-60
	6:25202	*See* ANL/CNSV-TM-60
	6:25203	*See* ANL/CNSV-TM-60
	6:25204	*See* ANL/CNSV-TM-60
	6:25437	*See* ANL/CNSV-TM-60
	6:25629	*See* ANL/CNSV-TM-60
	6:25630	*See* ANL/CNSV-TM-60
	6:25824	*See* ANL/CNSV-TM-60
	6:25825	*See* ANL/CNSV-TM-60
	6:25826	*See* ANL/CNSV-TM-60
	6:25827	*See* ANL/CNSV-TM-60
	6:25828	*See* ANL/CNSV-TM-60
	6:25829	*See* ANL/CNSV-TM-60
	6:25830	*See* ANL/CNSV-TM-60
	6:25831	*See* ANL/CNSV-TM-60
	6:25832	*See* ANL/CNSV-TM-60
	6:25833	*See* ANL/CNSV-TM-60
	6:26054	*See* ANL/CNSV-TM-60
	6:26055	*See* ANL/CNSV-TM-60
	6:26056	*See* ANL/CNSV-TM-60
	6:26057	*See* ANL/CNSV-TM-60
	6:26058	*See* ANL/CNSV-TM-60
	6:26059	*See* ANL/CNSV-TM-60
	6:26300	*See* ANL/CNSV-TM-60
	6:26301	*See* ANL/CNSV-TM-60
CONF-810308-	(American Chemical Society symposium on the chemistry of engine combustion deposits, Atlanta, GA, USA, 29 Mar-3 Apr 1981)	
(Vol.3)	6:24874	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 94-104(29 Mar 1981)
(Vol.3)	6:24875	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 105-113(29 Mar 1981)
(Vol.3)	6:24876	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 114-122(29 Mar 1981)
(Vol.3)	6:24877	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 124-129(29 Mar 1981)
(Vol.3)	6:24878	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 132-141(29 Mar 1981)
(Vol.3)	6:24907	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 4-9(29 Mar 1981)
(Vol.3)	6:24908	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 16-19(29 Mar 1981)
(Vol.3)	6:24909	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 20-25(29 Mar 1981)
(Vol.3)	6:24910	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 31-34(29 Mar 1981)
(Vol.3)	6:24911	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 50-59(29 Mar 1981)
(Vol.3)	6:24912	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 1, 60-66(29 Mar 1981)
(Vol.3)	6:24921	University Microfilms, Ann Arbor, MI,, $8.00
(Vol.4)	6:24879	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 121-126(29 Mar 1981)
(Vol.4)	6:24880	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 133-148(29 Mar 1981)
(Vol.4)	6:24881	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 149-158(29 Mar 1981)
(Vol.4)	6:24882	Am. Chem. Soc., Div. Fuel Chem , Prepr., 26: No. 2, 173-178(29 Mar 1981)
(Vol.4)	6:24913	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 1-6(29 Mar 1981)
(Vol.4)	6:24914	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 38-48(29 Mar 1981)
(Vol.4)	6:24915	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 55-58(29 Mar 1981)
(Vol.4)	6:24916	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 181-190(29 Mar 1981)
(Vol.4)	6:24922	University Microfilms, Ann Arbor, MI, $8.00
(Vol.4)	6:24931	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 49-54(29 Mar 1981)
(Vol.4)	6:25972	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 68-76(29 Mar 1981)
CONF-810315-	(8. energy technology conference and exposition, Washington, DC, USA, 9-11 Mar 1981)	
13	6:25586	NTIS, PC A02/MF A01. Order Number DE81023543, Distribution Category MN -94ca
CONF-810347-	(NACE international conference on high temperature corrosion, San Diego, CA, USA, 2-6 Mar 1981)	
3	6:26010	*See* DOE/NASA/2593-27
CONF-810351-	(INS meeting on nuclear radiation detectors, Tokyo, Japan, 23-26 Mar 1981)	
2	6:26079	*See* LBL-12380
CONF-810380-	(Biogas and alcohol fuels seminar, Chicago, IL, USA, 12-13 Mar 1981)	
1	6:25194	Chicago, IL; Inst. of Gas Technology (1981).
CONF-810408-	(SAMPE symposium/exhibition, Los Angeles, CA, USA, 28-30 Apr 1981)	
	6:25381	Azusa, CA; Society for the Advancement of Material and Process Engineering (1981).
CONF-810429-	(Conference on optics, Santa Fe, NM, USA, 6-10 Apr 1981)	
27	6:26696	*See* LA-UR-81-1395
CONF-810442-	(Joint workshop on negative ions, Mexico City, Mexico, 1-4 Apr 1981)	
3	6:26454	*See* LBL-12454
CONF-810456-	(14. oil shale symposium, Golden, CO, USA, 22-24 Apr 1981)	
4	6:25087	*See* UCRL-85312

Report No.	Abstract No.	Availability
CONF-810484-		(Symposium on advances in coal utilization technology IV, Denver, CO, USA, 20-24 Apr 1981)
1	6:24888	Chicago, IL; Institute of Gas Technology (1981).
CONF-810487-		(28. annual meeting of the Society of Soft Drink Technologists, Colorado Springs, CO, USA, 26-29 Apr 1981)
1	6:25820	Chicago, IL; Institute of Gas Technology (1981).
CONF-810497-		(International symposium on metalhydrogen systems, Miami Beach, FL, USA, 13-15 Apr 1981)
2	6:26608	*See* BNL-28332
CONF-810512-		(Workshop on EBT stability theory, Oak Ridge, TN, USA, 13-14 May 1981)
1	6:26645	*See* UCRL-85826
CONF-810523-		(Topical conference on computerized data acquisition in particle and nuclear physics, Oak Ridge, TN, USA, 28-30 May 1981)
7	6:26090	*See* SLAC-PUB-2738
CONF-810527-		(International conference on plasma science, Sante Fe, NM, USA, 18-20 May 1981)
4	6:26713	*See* UCRL-86041
CONF-810528-		(83. symposium on nucleation and crystallization in glasses, Washington, DC, USA, 3-6 May 1981)
4	6:25134	*See* PNL-SA-9102
CONF-810539-		(Conference on the application of microprocessors to high energy physics experiments, Geneva, Switzerland, 4-6 May 1981)
4	6:26077	*See* FERMILAB-Conf-81/40-EXP
CONF-810546-		(1981 spring DECUS U.S. symposium, Miami Beach, FL, USA, 18-21 May 1981)
3	6:26728	*See* SLAC-PUB-2727
CONF-810560-		(AS/ISES special interest group on energy and environment information conference, Denver, CO, USA, 11-12 May 1981)
2	6:25220	*See* SERI/TP-753-1205
CONF-810561-		(3. IEE international pulsed power conference, Albuquerque, NM, USA, 31 May-3 Jun 1981)
1	6:26699	*See* LA-UR-81-1641
CONF-810562-		(U.S. EPA workshop on combustion products of synfuels, Alexandria, VA, USA, 13-14 May 1981)
1	6:26388	NTIS, PC A02/MF A01. Distribution Category MN -41
CONF-810568-		(IAEA/IWGFR specialist meeting, Karlsruhe, F.R. Germany, 11-14 May 1981)
2	6:25495	*See* HEDL-SA-2405-FP
CONF-810576-		(Topical conference on symmetry aspects of inertial fusion implosions, Washington, DC, USA, 27-28 May 1981)
1	6:26698	*See* LA-UR-81-1566
CONF-810577-		(36. annual Purdue industrial waste conference, Lafayette, IN, USA, 12-14 May 1981)
1	6:25819	Chicago, IL; Inst. of Gas Tech. (1981).
CONF-810580-		(Prospective on adaptive nuclear energy evolutions: towards a world of neutron abundance conference, Laxenberg, Austria, 25-27 May 1981)
1	6:26066	*See* BNL-29588
CONF-810581-		(Powder and bulk solids conference, Chicago, IL, USA, 12-14 May 1981)
2	6:25987	Chicago, IL; Institute of Gas Technology (1981).
CONF-810583-		(Rail carrier workshop, Columbus, OH, USA, 13-14 May 1981)
1	6:26018	NTIS, PC A02/MF A01. Distribution Category MN -46
CONF-810586-		(Argonne symposium on high energy spectrometry, Argonne, IL, USA, 11-13 May 1981)
1	6:26071	*See* LBL-12797
CONF-810587-		(17. Midwestern mechanics conference, Ann Arbor, MI, USA, 6-8 May 1981)
1	6:26045	*See* IS-M-328
CONF-810589-		(Annual meeting of the Bunsen Gesellschaft fur Physikalische Chemie, Marburg, F.R. Germany, 29-30 May 1981)
1	6:25980	*See* LBL-12761
CONF-810590-		(Annual Edison Electric Institute conference, Philadelphia, PA, USA, 1-2 May 1981)
1	6:25841	*See* LBL-12595
CONF-810591-		(Meeting on the effects of residual stresses on fatigue, Phoenix, AZ, USA, 11 May 1981)
1	6:25903	*See* EGG-M-01981
CONF-810594-		(Conference on deposition and clearance of aerosols in the human respiratory tract, Bad Gleichenberg, Austria, 22-23 May 1981)
1	6:26392	*See* UR-3490-2026
CONF-810602-		(7. symposium on detonation, Annapolis, MD, USA, 19 Jun 1981)
28	6:26099	*See* UCRL-85187
CONF-810606-		(American Nuclear Society's annual meeting, Miami Beach, FL, USA, 7-12 Jun 1981)
39	6:26317	*See* DP-MS-81-1
40	6:26629	NTIS, PC A02/MF A01. Order Number DE81024907, Distribution Category MN -20d
42	6:25520	NTIS, PC A02/MF A01. Order Number DE81024968, Distribution Category MN -79d
46	6:26630	NTIS, PC A02/MF A01. Order Number DE81023016, Distribution Category MN -20
48	6:25119	NTIS, PC A02/MF A01. Order Number DE81024909, Distribution Category MN -70
52	6:25484	NTIS, PC A02/MF A01. Order Number DE81023271, Distribution Category MN -77
53	6:26597	NTIS, PC A02/MF A01. Order Number DE81023210, Distribution Category MN -34C
54	6:25521	NTIS, PC A02/MF A01. Order Number DE81023267, Distribution Category MN -79a
55	6:25507	NTIS, PC A02/MF A01. Distribution Category MN -79b
56	6:25489	NTIS, PC A02/MF A01. Order Number DE81023209, Distribution Category MN -79b
58	6:26166	*See* HEDL-SA-2302
59	6:25526	*See* HEDL-SA-2329-FP
60	6:25099	*See* HEDL-SA-2332-FP
61	6:25511	*See* HEDL-SA-2300
62	6:25513	*See* HEDL-SA-2373-FP
63	6:25509	*See* HEDL-SA-2105-FP
64	6:25500	*See* HEDL-SA-2322-FP
66	6:25510	*See* HEDL-SA-2194
67	6:25512	*See* HEDL-SA-2316-FP
68	6:26598	NTIS, PC A02/MF A01. Order Number DE81023184, Distribution Category MN -34C
69	6:25502	*See* HEDL-SA-2323
CONF-810607-		(Symposium on instrumentation and control for fossil energy processes, San Francisco, CA, USA, 8-12 Jun 1981)
6	6:24873	*See* SAND-81-1347C
8	6:24946	NTIS, PC A02/MF A01. Distribution Category MN -90b
10	6:24947	NTIS, PC A02/MF A01. Order Number DE81023191, Distribution Category MN -90b
CONF-810620-		(4. international topical conference on high-power electron and ion-beam research and technology, Palaiseau, France, 29 Jun-3 Jul 1981)
2	6:26708	*See* SAND-81-0599C
3	6:26707	*See* SAND-81-0477C
4	6:26033	*See* UCRL-85653
CONF-810621-		(Symposium on fluid mechanics of combustion systems, Boulder, CO, USA, 22-24 Jun 1981)
5	6:26142	NTIS, PC A03/MF A01. Order Number DE81023940, Distribution Category MN -11
CONF-810622-		(8. ocean energy conference, Washington, DC, USA, 7-11 Jun 1981)
1	6:25313	NTIS, PC A02/MF A01. Distribution Category MN -64
2	6:25314	NTIS, PC A02/MF A01. Distribution Category MN -64
3	6:25320	*See* SERI/TP-631-1270
4	6:25410	*See* SERI/TP-634-1215
5	6:25315	NTIS, PC A02/MF A01. Order Number DE81024253, Distribution Category MN -64
CONF-810623-		(24. midwest symposium on circuits and systems, Albuquerque, NM, USA, 29-30 Jun 1981)
4	6:26712	*See* SAND-81-1524C

Report No.	Abstract No.	Availability
CONF-810625-	(ASME PVP conference, Denver, CO, USA, 21-26 Jun 1981)	
18	6:25899	NTIS, PC A02/MF A01. Order Number DE81024128, Distribution Category MN -25
CONF-810630-	(2. international photoacoustic spectroscopy conference, Berkeley, CA, USA, 22-25 Jun 1981)	
6	6:26032	NTIS, PC A02/MF A01. Order Number DE81024122, Distribution Category MN -34
CONF-810639-	(19. symposium on the engineering aspects of magnetohydrodynamics, Tullahoma, TN, USA, 15-17 Jun 1981)	
5	6:25651	*See* DOE/NASA/10769-14
CONF-810647-	(Conference on X- and gamma-ray sources and applications, Ann Arbor, MI, USA, 10-12 Jun 1981)	
6	6:25964	NTIS, PC A02/MF A01. Order Number DE81023230, Distribution Category MN -4
CONF-810649-	(4. international conference on nuclei far from stability, Helsignor, Denmark, 7-13 Jun 1981)	
1	6:26589	*See* LA-UR-81-1593
4	6:26583	*See* BNL-29658
5	6:26590	*See* LA-UR-81-1721
6	6:26592	NTIS, PC A02/MF A01. Order Number DE81024246, Distribution Category MN -34C
CONF-810651-	(1981 topical conference on low-energy X-ray diagnostics, Livermore, CA, USA, 8-10 Jun 1981)	
1	6:26636	*See* LA-UR-81-1611
CONF-810652-	(International symposium on health impacts of different sources of energy, Nashville, TN, USA, 22-26 Jun 1981)	
1	6:24905	*See* MLM-2829(OP)
4	6:26192	*See* IAEA-SM-254/63
5	6:24971	NTIS, PC A02/MF A01. Order Number DE81024123, Distribution Category MN -90i
CONF-810654-	(IEA Tokamak quality assurance workshop, Princeton, NJ, USA, 2 Jun 1981)	
1	6:26697	*See* LA-UR-81-1416
2	6:26688	NTIS, PC A02/MF A01. Order Number DE81023224, Distribution Category MN -20
CONF-810659-	(3. IEEE international pulsed power conference, Albuquerque, NM, USA, 1-3 Jun 1981)	
1	6:26709	*See* SAND-81-0695C
2	6:26072	*See* SAND-81-0844C
5	6:26635	*See* LA-UR-81-1601
7	6:26710	*See* SAND-81-0750C
9	6:26711	*See* SAND-81-0751C
CONF-810666-	(International conference on fourier transform infrared spectroscopy, Columiba, SC, USA, 8-12 Jun 1981)	
1	6:25982	*See* SAND-80-2594C
CONF-810672-	(DOE heat pump contractors' program integration meeting, McLean, VA, USA, 2-4 Jun 1981)	
4	6:25865	*See* DOE/NASA/51040-28
10	6:25710	NTIS, PC A02/MF A01. Order Number DE81024085, Distribution Category MN -95d
16	6:25711	NTIS, PC A02/MF A01. Order Number DE81024911, Distribution Category MN -95d
CONF-810677-	(International microwave power symposium, Toronto, Canada, 9-12 Jun 1981)	
1	6:24948	*See* IS-M-311
CONF-810682-	(6. international conference: Modern trends in activation analysis, Toronto, Canada, 15-19 Jun 1981)	
1	6:25971	*See* SAND-81-0156C
3	6:25965	NTIS, PC A02/MF A01. Order Number DE81023064, Distribution Category MN -4
5	6:25966	*See* DOE/EV/10403-2
CONF-810683-	(International joint conference on thermophysical properties, Gaithersburg, MD, USA, 15-19 Jun 1981)	
2	6:26724	*See* SAND-80-2602C
3	6:26614	*See* SAND-80-2694C
CONF-810684-	(APS conference on shock waves in condensed matter, Menlo Park, CA, USA, 23-25 Jun 1981)	
1	6:26047	*See* SAND-81-1528C
2	6:26046	*See* SAND-81-1477C
3	6:25915	*See* SAND-81-0108C
4	6:25984	*See* SAND-81-1352C
5	6:25992	*See* SAND-81-1350C
6	6:25911	*See* SAND-80-2800C
7	6:26062	*See* SAND-81-0050C
8	6:25914	*See* SAND-81-0041C
9	6:25937	*See* SAND-80-0019C
10	6:25985	*See* SAND-81-1455C
11	6:25940	*See* SAND-80-2836C
12	6:26023	*See* SAND-80-2865C
13	6:25912	*See* SAND-80-2847C
14	6:25993	*See* SAND-81-1386C
15	6:25953	*See* SAND-81-1354C
16	6:25952	*See* SAND-81-1315C
17	6:26615	*See* UCRL-85288
18	6:26092	*See* UCRL-86285
19	6:25913	*See* SAND-80-2864C
32	6:25080	*See* LA-UR-81-1659
33	6:26026	*See* UCRL-85298
CONF-810687-	(US/USSR workshop on carbon dioxide and climate, Leningrad, USSR, 15-19 Jun 1981)	
1	6:26163	*See* UCRL-85754
CONF-8106100-	(International conference on laser spectroscopy, Alberta, Canada, 29 Jun-3 Jul 1981)	
1	6:26451	NTIS, PC A02/MF A01. Order Number DE81024252, Distribution Category MN -34A
CONF-8106108-	(Low energy X-ray conference, Monterey, CA, USA, Jun 1981)	
1	6:26609	*See* LA-UR-81-1712
CONF-8106114-	(Europhysics conference on nuclear physics, Hvar, Croatia, Yugoslavia, 29 Jun-3 Jul 1981)	
1	6:26574	*See* LBL-12596
CONF-810706-	(Institute of Nuclear Materials Management conference, San Francisco, CA, USA, 13 Jul 1981)	
4	6:25173	*See* SAND-81-0586C
6	6:26722	*See* MLM-2841(OP)
7	6:25102	*See* MLM-2842(OP)
CONF-810721-	(5. international system safety conference, Denver, CO, USA, 26-31 Jul 1981)	
1	6:25876	*See* DOE/NASA/51040-25
2	6:25421	*See* DOE/NASA/20320-31
CONF-810722-	(International symposium on migration in the terrestrial environment of long-lived radionuclides from the nuclear fuel cycle, Knoxville, TN, USA, 27-31 Jul 1981)	
1	6:25120	NTIS, PC A02/MF A01. Order Number DE81023527, Distribution Category MN -70
CONF-810801-	(6. international conference on structural mechanics in reactor technology, Paris, France, 17-21 Aug 1981)	
3(Summ.)	6:25522	NTIS, PC A02/MF A01. Distribution Category MN -78
4	6:25170	*See* UCRL-85458
5	6:25171	*See* UCRL-85460
11	6:25486	*See* GA-A-16269
12	6:25538	*See* SAND-81-0353C
34	6:25946	*See* GA-A-16001
35	6:25485	*See* GA-A-16234
41	6:25517	*See* BNL-29358
44	6:26020	*See* GA-A-16161
CONF-810804-	(National heat transer conference, Milwaukee, WI, USA, 2-5 Aug 1981)	
4	6:25490	NTIS, PC A02/MF A01. Distribution Category MN -79k
8	6:26011	*See* LBL-12767
CONF-810805-	(SIGGRAPH'81 meeting, Dallas, TX, USA, 3-7 Aug 1981)	
1	6:26720	*See* LA-UR-80-3642
2	6:26721	*See* LA-UR-80-3716
3	6:26719	*See* LA-UR-80-3457
CONF-810806-	(Conference on small break loss of coolant accident analysis in LWR's, Monterey, CA, USA, 25-27 Aug 1981)	
3	6:25529	*See* LA-UR-81-1519
4	6:25530	*See* LA-UR-81-1520
5	6:25531	*See* LA-UR-81-1521
6	6:25532	*See* LA-UR-81-1556
7	6:25528	*See* LA-UR-81-1498
CONF-810807-	(BSSM-SESA international conference, Edinburgh, UK, 31 Aug-4 Sep 1981)	
1	6:26088	*See* SAND-80-2689C
CONF-810808-	(Energy in the man-built environment: the next decade specialty conference, Vail, CO, USA, 3-5 Aug 1981)	
3	6:25834	*See* BNL-29282

Report No.	*Abstract No.*	*Availability*
4	6:25399	*See* LA-UR-81-852
6	6:25349	*See* SERI/TP-641-1222
7	6:25256	*See* SAND-81-1164C
CONF-810809-	(16. international conference on low temperature physics, Los Angeles, CA, USA, 19-25 Aug 1981)	
1	6:25950	*See* LA-UR-81-1017
7	6:25981	*See* MLM-2817(OP)
8	6:25983	*See* SAND-81-0969C
11	6:25951	*See* LA-UR-81-1044
CONF-810810-	(SPIE international symposium, San Diego, CA, USA, 24-28 Aug 1981)	
1	6:26089	*See* SAND-81-0650C
2	6:26091	*See* UCRL-85655
4	6:26083	*See* UCRL-85604
CONF-810812-	(IECEC conference, Atlanta, GA, USA, 9-14 Aug 1981)	
1	6:25035	*See* SAND-81-0882C
2	6:25883	*See* Y/DX-290
3	6:25382	*See* SAND-80-2867C
4	6:25578	*See* DOE/ET/20279-130
6	6:25589	*See* SAND-81-0226C
7	6:25670	*See* LA-UR-81-1054
8	6:25177	*See* LA-UR-81-1050
10	6:25527	*See* LA-UR-81-1371
11	6:25400	*See* LA-UR-81-1265
17	6:25864	*See* DOE/NASA/51040-26
18	6:25588	*See* LBL-12657
19	6:25669	*See* DOE/NASA/12726-8
20	6:25671	*See* LBL-12754
CONF-810813-	(National American Chemical Society summer meeting, New York, NY, USA, 23-28 Aug 1981)	
2	6:26289	*See* UCRL-85673
3	6:25942	*See* UCRL-85744
4	6:26331	*See* BNL-29433
8	6:26112	*See* BNL-29526
CONF-810814-	(91. national meeting of the American Institute of Chemical Engineers, Detroit, MI, USA, 16-19 Aug 1981)	
1	6:25881	*See* UCRL-85902
2	6:25067	*See* MLM-2831(OP)
CONF-810817-	(Implementation of computer procedures and stress-strain laws in geotechnical engineering conference, Blacksburg, VA, USA, 3-6 Aug 1981)	
1	6:24934	*See* LBL-11896
CONF-810821-	(US-Italy workshop in digital signal processing, Portovenere, Italy, 25-31 Aug 1981)	
1	6:26729	*See* UCRL-86104
CONF-810823-	(NSC industrial conference, Moline, IL, USA, 13 Aug 1981)	
1	6:25607	*See* SAND-81-1359C
COO-		
1599-22(Pt.3)	6:26208	*See* DOE/EV/01599-T1(Pt.3)
1599-22(Pt.5)	6:26210	*See* DOE/EV/01599-T1(Pt.5)
1599-178	6:26208	*See* DOE/EV/01599-T1(Pt.3)
1599-188	6:26209	*See* DOE/EV/01599-T1(Pt.4)
1599-202(Pt.1)	6:26207	*See* DOE/EV/01599-T1(Pt.1)
1599-202(Pt.4)	6:26209	*See* DOE/EV/01599-T1(Pt.4)
2200-13	6:26632	*See* DOE/ET/53041-13
2826-14	6:25497	*See* PNE-81-149
3056-59	6:25659	*See* DOE/ET/11292-T4
3056-62	6:25660	*See* DOE/ET/11292-T5
4380-4	6:25248	*See* DOE/ER/04380-T1
4697-2	6:25338	*See* DOE/CS/34697-T3
4697-3	6:25390	*See* DOE/CS/34697-T1
CRA-		
79-313-S	6:25088	NTIS, PC A11/MF A01. Order Number DE81024135, Distribution Category MN -98
DLCS-		
5000181	6:25483	NTIS, PC A02/MF A01. Distribution Category MN -78
DOE/AF/92003-		
1	6:25191	NTIS, PC A03/MF A01. Order Number DE81023293, Distribution Category MN -61a
DOE/BC/10043-		
25	6:25052	NTIS, PC A04/MF A01. Order Number DE81025707, Distribution Category STD -92b
DOE/BC/20001-		
10	6:24974	NTIS, PC A07/MF A01. Order Number DE81025222, Distribution Category STD -92a
DOE/BETC/IC-		
80/ 3(Vol.1)	6:24972	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24975	NTIS, PC A15/MF A01. Distribution Category STD -92a
80/ 3(Vol.1)	6:24976	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24977	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24978	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24979	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24980	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24981	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24982	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24983	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24984	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24985	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24986	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24987	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24988	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24989	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24990	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24991	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24992	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24993	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24994	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24995	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24996	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24997	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24998	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:24999	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:25040	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:25047	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:25081	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:25082	NTIS, PC A15/MF A01
80/ 3(Vol.1)	6:26019	NTIS, PC A15/MF A01
80/ 3(Vol.2)	6:25000	NTIS, PC A17/MF A01. Distribution Category STD -92
80/ 3(Vol.2)	6:25001	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25002	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25003	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25004	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25005	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25006	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25007	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25008	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25009	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25010	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25011	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25012	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25013	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25014	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25015	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25016	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25017	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25018	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25019	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25020	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25021	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25022	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25023	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25024	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25025	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25026	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25027	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25028	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25029	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25030	NTIS, PC A17/MF A01
80/ 3(Vol.2)	6:25053	NTIS, PC A17/MF A01
80/ 3(Vol.4)	6:24899	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:24900	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:24901	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:24902	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25031	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25032	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25039	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25043	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25044	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25045	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25054	NTIS, PC A14/MF A01. Distribution Category STD -92
80/ 3(Vol.4)	6:25055	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25056	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25057	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25058	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25059	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25060	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25439	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25795	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25856	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25857	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25858	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25859	NTIS, PC A14/MF A01

Report No.	Abstract No.	Availability
80/ 3(Vol.4)	6:25860	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25861	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25885	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25886	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25887	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25888	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25889	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25890	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25891	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:25990	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:26716	NTIS, PC A14/MF A01
80/ 3(Vol.4)	6:26717	NTIS, PC A14/MF A01
DOE/BETC/OR-		
19	6:25033	NTIS, PC A04/MF A01. Distribution Category STD -92a
DOE/BETC/RI-		
81/ 1	6:25046	NTIS, PC A02/MF A01. Order Number DE81024428, Distribution Category STD -92b
DOE/CE-		
0011/ 14	6:25880	NTIS, PC A02/MF A01. Order Number DE81023784, Distribution Category STD -96
DOE/CE/04934-		
46	6:25598	NTIS, PC A02/MF A01. Order Number DE81023147, Distribution Category STD -97e
DOE/CE/20088-		
01	6:25837	NTIS, PC A03/MF A01. Order Number DE81025850, Distribution Category STD -95e
DOE/CE/20098-		
1	6:25181	NTIS, PC A11/MF A01. Order Number DE81025849, Distribution Category STD -95e
DOE/CE/20184-		
1	6:25717	NTIS, PC A08/MF A01. Distribution Category STD -95d
DOE/CE/20237-		
1	6:25838	NTIS, PC A04/MF A01. Order Number DE81025848, Distribution Category STD -95e
DOE/CH/03000-		
T3	6:26075	NTIS, PC A02/MF A01. Order Number DE81024925, Distribution Category MN -28
DOE/CH/10003-		
1	6:25294	NTIS, PC A06/MF A01. Order Number DE81023343, Distribution Category MN -63d
DOE/CH/10048-		
1	6:26436	NTIS, PC A03/MF A01. Order Number DE81025761, Distribution Category MN -34B
DOE/CH/90035-		
4	6:25083	NTIS, PC A11/MF A01. Order Number DE81024988, Distribution Category STD -91
DOE/CS/10046-		
2(Vol.1)	6:25591	NTIS, PC A05/MF A01. Distribution Category STD -95c
2(Vol.2)	6:25592	NTIS, PC A13/MF A01. Distribution Category STD -95c
DOE/CS/10070-		
T1	6:25217	NTIS, PC A03/MF A01. Distribution Category MN -58c
DOE/CS/10210-		
T1	6:25327	NTIS, PC A04/MF A01. Distribution Category MN -59a
T2	6:25849	NTIS, PC A05/MF A01. Distribution Category MN -95
DOE/CS/10220-		
T1	6:25718	NTIS, PC A04/MF A01. Distribution Category MN -95f
DOE/CS/20156-		
T1	6:25839	NTIS, PC A04/MF A01. Distribution Category MN -95e
DOE/CS/20215-		
T1	6:25663	NTIS, PC A04/MF A01. Distribution Category MN -93
DOE/CS/20315-		
T11	6:25719	NTIS, PC A03/MF A01. Distribution Category MN -95d
DOE/CS/30217-		
T1	6:25328	NTIS, PC A13/MF A01. Distribution Category MN -58b
DOE/CS/30245-		
T1	6:25329	NTIS, PC A03/MF A01. Distribution Category MN -59
DOE/CS/30310-		
T1	6:25330	NTIS, PC A05/MF A01. Distribution Category MN -59b
T2	6:25331	NTIS, PC A03/MF A01. Distribution Category MN -59b
DOE/CS/30311-		
T2	6:25332	NTIS, PC A05/MF A01. Distribution Category MN -59c
DOE/CS/31521-		
T1	6:25333	NTIS, PC A08/MF A01. Distribution Category MN -59a
DOE/CS/31522-		
T2	6:25334	NTIS, PC A07/MF A01. Distribution Category MN -59
DOE/CS/31590-		
	6:25335	NTIS, PC A11/MF A01. Order Number DE81023559, Distribution Category MN -59
DOE/CS/34126-		
T1	6:25336	NTIS, PC A05/MF A01. Distribution Category MN -59c
DOE/CS/34135-		
T4	6:25337	NTIS, PC A03/MF A01. Distribution Category STD -59
DOE/CS/34697-		
T1	6:25390	NTIS, PC A05/MF A01. Order Number DE81023001, Distribution Category MN -59a
T3	6:25338	NTIS, PC A10/MF A01. Order Number DE81025221, Distribution Category MN -59a
DOE/CS/40177-		
T2	6:25182	NTIS, PC A06/MF A01. Order Number DE81023246, Distribution Category STD -95e
DOE/CS/40215-		
T1	6:25796	NTIS, PC A02/MF A01. Distribution Category MN -95f
DOE/CS/40287-		
T1	6:25797	NTIS, PC A04/MF A01. Distribution Category MN -95f
DOE/CS/40352-		
T1	6:25798	NTIS, PC A05/MF A01. Distribution Category STD -61a
DOE/CS/51213-		
T6	6:25882	NTIS, PC A02/MF A01. Distribution Category MN -94b
DOE/CS/58840-		
T1	6:25754	NTIS, PC A06/MF A01. Order Number DE81024297, Distribution Category MN -96
DOE/DP/00539-		
040	6:26195	NTIS, PC A04/MF A01. Distribution Category MN -41
042	6:26196	NTIS, PC A04/MF A01. Distribution Category MN -41
DOE/DP/40052-		
T1	6:26689	NTIS, PC A08/MF A01. Distribution Category MN -21
DOE/DP/40086-		
1(Vol.1)	6:26690	NTIS, PC A13/MF A01. Order Number DE81024498, Distribution Category MN -21
1(Vol.2)	6:26691	NTIS, PC A17/MF A01. Order Number DE81024494, Distribution Category MN -21
DOE/EIA-		
0095(80)	6:25435	NTIS, PC A15/MF A01. Order Number DE81025339, Distribution Category STD -97
0149-80	6:25599	NTIS, PC A09/MF A01. Order Number DE81026046, Distribution Category STD -13
0191(80)	6:25632	NTIS, PC A10/MF A01. Order Number DE81025524, Distribution Category STD -97
DOE/EIA/11096-		
T1	6:25590	NTIS, PC A06/MF A01. Distribution Category MN -32
DOE/ER-		
0045/ 6	6:25901	NTIS, PC A11/MF A01. Order Number DE81025775, Distribution Category STD -20c

Report No.	*Abstract No.*	*Availability*
0048/ 1	6:25902	NTIS, PC A06/MF A01. Order Number DE81025979, Distribution Category STD -20c
0103	6:25850	NTIS, PC A03/MF A01. Distribution Category MN -13
DOE/ER/03072-		
120	6:26482	NTIS, PC A06/MF A01. Order Number DE81024424, Distribution Category MN -34D
DOE/ER/03326-		
101	6:26308	NTIS, PC A02/MF A01. Order Number DE81025547, Distribution Category MN -48
DOE/ER/03416-		
21	6:25996	NTIS, PC A02/MF A01. Order Number DE81025636, Distribution Category MN -4
DOE/ER/04054-		
5	6:26425	NTIS, PC A02/MF A01. Distribution Category MN -11
DOE/ER/04206-		
T1	6:25508	NTIS, PC A02/MF A01. Distribution Category MN -80
DOE/ER/04380-		
T1	6:25248	NTIS, PC A02/MF A01. Order Number DE81023131, Distribution Category MN -94d
DOE/ER/04972-		
1	6:25089	NTIS, PC A05/MF A01. Order Number DE81025648, Distribution Category MN -51
DOE/ER/06035-		
3	6:25997	NTIS, PC A02/MF A01. Distribution Category MN -4
DOE/ER/10107-		
2	6:26692	NTIS, PC A03/MF A01. Order Number DE81023233, Distribution Category MN -20c
DOE/ER/10160-		
4	6:26437	NTIS, PC A04/MF A01. Order Number DE81024033, Distribution Category MN -34B
T5	6:25295	NTIS, PC A03/MF A01. Order Number DE81025323, Distribution Category MN -63d
DOE/ER/10407-		
2	6:26602	NTIS, PC A02/MF A01. Distribution Category MN -34C
DOE/ER/10424-		
1	6:25998	NTIS, PC A02/MF A01. Distribution Category MN -4
DOE/ER/10458-		
2	6:25978	NTIS, PC A02/MF A01. Distribution Category MN -4
DOE/ER/10518-		
2	6:25799	NTIS, PC A04/MF A01. Order Number DE81023036, Distribution Category MN -95f
DOE/ER/10603-		
1	6:25991	NTIS, PC A02/MF A01. Order Number DE81023295, Distribution Category MN -4
DOE/ER/10612-		
3	6:26452	NTIS, PC A12/MF A01. Order Number DE81024422, Distribution Category MN -34A
DOE/ER/10762-		
1	6:26426	NTIS, PC A02/MF A01. Distribution Category MN -11
DOE/ER/10765-		
T1	6:26427	NTIS, PC A03/MF A01. Order Number DE81024473, Distribution Category MN -4
DOE/ERD-		
0031	6:26303	NTIS, PC A08/MF A01. Order Number DE81026037, Distribution Category STD -11
DOE/ET/03425-		
21	6:26143	NTIS, PC A03/MF A01. Order Number DE81025548, Distribution Category MN -11
DOE/ET/10381-		
150	6:26060	NTIS, PC A05/MF A01. Distribution Category MN -90e
DOE/ET/10482-		
T1	6:24903	NTIS, PC A03/MF A01. Order Number DE81023695, Distribution Category STD -90a
DOE/ET/10669-		
T7	6:24842	NTIS, PC A05/MF A01. Order Number DE81021739, Distribution Category MN -90c
DOE/ET/10815-		
T4	6:25650	NTIS, PC A04/MF A01. Order Number DE81025200, Distribution Category STD -90g
DOE/ET/11292-		
T4	6:25659	NTIS, PC A05/MF A01. Distribution Category MN -93
T5	6:25660	NTIS, PC A04/MF A01. Distribution Category MN -93
DOE/ET/11304-		
T12	6:25664	NTIS, PC A06/MF A01. Order Number DE81025228, Distribution Category MN -93
DOE/ET/12056-		
12	6:25034	NTIS, PC A03/MF A01. Order Number DE81025642, Distribution Category MN -92a
DOE/ET/13060-		
T3(Vol.2)	6:24843	NTIS, PC A05/MF A01. Order Number DE81025191, Distribution Category STD -89
T3(Vol.6)	6:24844	NTIS, PC A03/MF A01. Order Number DE81025179, Distribution Category STD -89
T3(Vol.7)	6:24845	NTIS, PC A03/MF A01. Order Number DE81025190, Distribution Category STD -89
T3(Vol.12)	6:24846	NTIS, PC A03/MF A01. Order Number DE81025183, Distribution Category STD -89
T3(Vol.13)	6:24847	NTIS, PC A03/MF A01. Order Number DE81025391, Distribution Category STD -89
T4	6:24848	NTIS, PC A03/MF A01. Order Number DE81024967, Distribution Category STD -89
DOE/ET/14700-		
5	6:24849	NTIS, PC A03/MF A01. Order Number DE81023260, Distribution Category STD -90d
DOE/ET/14752-		
T5	6:24850	NTIS, PC A07/MF A01. Distribution Category STD -90c
DOE/ET/14809-		
6	6:24851	NTIS, PC A03/MF A01. Order Number DE81023949, Distribution Category MN -90d
DOE/ET/17019-		
3	6:25665	NTIS, PC A08/MF A01. Order Number DE81024470, Distribution Category STD -93
DOE/ET/20279-		
115	6:25296	NTIS, PC A05/MF A01. Order Number DE81025902, Distribution Category STD -63a
130	6:25578	NTIS, PC A02/MF A01. Distribution Category MN -63d
DOE/ET/21056-		
T3	6:25316	NTIS, PC A08/MF A01. Distribution Category STD -64
DOE/ET/21067-		
2	6:24852	NTIS, PC A02/MF A01. Order Number DE81024112, Distribution Category MN -62e
T1	6:25339	NTIS, PC A04/MF A01. Distribution Category MN -62e
DOE/ET/23007-		
80/ 1	6:25420	NTIS, PC A10/MF A01. Order Number DE81024093, Distribution Category STD -60
DOE/ET/23108-		
7	6:25249	NTIS, PC A02/MF A01. Order Number DE81023076, Distribution Category STD -63
DOE/ET/26704-		
7	6:25616	NTIS, PC A02/MF A01. Order Number DE81025629, Distribution Category MN -94

Report No.	Abstract No.	Availability
DOE/ET/27203-		
1	6:25394	NTIS, PC A04/MF A01. Order Number DE81023938, Distribution Category STD -66e
DOE/ET/27242-		
T1	6:25393	NTIS, PC A08/MF A01. Distribution Category STD -66i
DOE/ET/29356-		
6	6:25472	NTIS, PC A07/MF A01. Order Number DE81025006, Distribution Category STD -97a
DOE/ET/33003-		
T2	6:25657	NTIS, PC A04/MF A01. Distribution Category MN -23
DOE/ET/33066-		
2	6:26453	NTIS, PC A08/MF A01. Order Number DE81024438, Distribution Category MN -34
DOE/ET/34009-		
T1	6:25482	NTIS, PC A03/MF A01. Distribution Category MN -98F
DOE/ET/53025-		
T8	6:26631	NTIS, PC A02/MF A01. Distribution Category MN -20g
DOE/ET/53041-		
13	6:26632	NTIS, PC A02/MF A01. Order Number DE81024935, Distribution Category MN -20g
DOE/EV/01599-		
T1(Pt.1)	6:26207	NTIS, PC A03/MF A01. Distribution Category MN -48
T1(Pt.3)	6:26208	NTIS, PC A04/MF A01. Distribution Category MN -48
T1(Pt.4)	6:26209	NTIS, PC A07/MF A01. Distribution Category MN -48
T1(Pt.5)	6:26210	NTIS, PC A03/MF A01. Distribution Category MN -48
DOE/EV/02283-		
2	6:26315	NTIS, PC A02/MF A01. Order Number DE81025053, Distribution Category MN -48
DOE/EV/02530-		
17	6:26191	NTIS, PC A02/MF A01. Order Number DE81023349, Distribution Category MN -11
DOE/EV/10403-		
2	6:25966	NTIS, PC A02/MF A01. Order Number DE81025042, Distribution Category MN -4
3	6:25967	NTIS, PC A03/MF A01. Order Number DE81025041, Distribution Category MN -4
DOE/EV/10428-		
8	6:26144	NTIS, PC A08/MF A01. Distribution Category MN -11
9	6:26733	NTIS, PC A02/MF A01. Distribution Category MN -11
11	6:26145	NTIS, PC A04/MF A01. Order Number DE81024430, Distribution Category MN -11
DOE/EV/10449-		
T1	6:26146	NTIS, PC A06/MF A01. Distribution Category MN -41
DOE/EV/10475-		
1	6:26147	NTIS, PC A06/MF A01. Order Number DE81025061, Distribution Category MN -11
DOE/EV/10503-		
1	6:26316	NTIS, PC A02/MF A01. Order Number DE81024380, Distribution Category MN -48
DOE/FC/02030-		
T1	6:24957	NTIS, PC A03/MF A01. Distribution Category MN -90e
DOE/FC/10121-		
T1	6:24853	NTIS, PC A02/MF A01. Order Number DE81024402, Distribution Category STD -90d
DOE/ID/01570-		
T21(Vol.1)	6:25209	NTIS, PC A12/MF A01. Distribution Category STD -97e
T21(Vol.2) App.A-K	6:25211	NTIS, PC A14/MF A01. Distribution Category STD -97e
T21(Vol.3) App.L	6:25212	NTIS, PC A05/MF A01. Distribution Category STD -97e
DOE/ID/12014-		
T1	6:25392	NTIS, PC A04/MF A01. Order Number DE81024315, Distribution Category MN -66h
DOE/ID/12051-		
T1	6:25406	NTIS, PC A04/MF A01. Order Number DE81023338, Distribution Category MN -66g
DOE/JPL/954331-		
81/ 14	6:25250	NTIS, PC A05/MF A01. Order Number DE81023936, Distribution Category STD -63b
DOE/JPL/955825-		
81/ 1	6:25251	NTIS, PC A02/MF A01. Order Number DE81023405, Distribution Category STD -63b
DOE/JPL/955909-		
81/ 2	6:25252	NTIS, PC A03/MF A01. Distribution Category STD -63b
DOE/MC-		
159	6:24854	NTIS, PC A03/MF A01. Order Number DE81023371, Distribution Category STD -90h
169	6:24855	NTIS, PC A03/MF A01. Order Number DE81025186, Distribution Category STD -90h
DOE/MC/10389-		
T1	6:25068	NTIS, PC A07/MF A01. Distribution Category MN -91
DOE/MC/17783-		
T1	6:24856	NTIS, PC A03/MF A01. Distribution Category STD -90a
DOE/METC-		
120	6:25068	*See* DOE/MC/10389-T1
DOE/MI/01002-		
T5	6:25218	NTIS, PC A02/MF A01. Order Number DE81025194, Distribution Category MN -58b
T5(App.A)	6:25222	NTIS, PC A05/MF A01. Order Number DE81025195, Distribution Category MN -58b
T5(App.B)	6:26302	NTIS, PC A03/MF A01. Order Number DE81025196, Distribution Category MN -58b
T5(App.C)	6:25223	NTIS, PC A05/MF A01. Order Number DE81024383, Distribution Category MN -58c
DOE/NASA/0008-		
12	6:25862	NTIS, PC A12/MF A01. Order Number DE81023765, Distribution Category MN -96
DOE/NASA/0126-		
1	6:25666	NTIS, PC A05/MF A01. Order Number DE81024276, Distribution Category MN -94cb
DOE/NASA/0138-		
1	6:25579	NTIS, PC A10/MF A01. Order Number DE81025248, Distribution Category STD -94a
DOE/NASA/0144-		
81/ 1	6:25863	NTIS, PC A07/MF A01. Distribution Category MN -96
DOE/NASA/0180-		
1	6:25297	NTIS, PC A10/MF A01. Order Number DE81024958, Distribution Category MN -63
DOE/NASA/0201-		
2	6:25667	NTIS, PC A02/MF A01. Distribution Category MN -93
DOE/NASA/0226-		
1	6:25875	NTIS, PC A09/MF A01. Distribution Category STD -96
DOE/NASA/2593-		
27	6:26010	NTIS, PC A02/MF A01. Order Number DE81024030, Distribution Category STD -90h
DOE/NASA/6229-		
2	6:25668	NTIS, PC A02/MF A01. Order Number DE81024393, Distribution Category MN -93
DOE/NASA/10769-		
14	6:25651	NTIS, PC A02/MF A01. Distribution Category STD -90d

Report No.	Abstract No.	Availability
DOE/NASA/12726-8	6:25669	NTIS, PC A02/MF A01. Order Number DE81023797, Distribution Category STD -94
DOE/NASA/20320-31	6:25421	NTIS, PC A02/MF A01. Distribution Category STD -60
DOE/NASA/51040-25	6:25876	NTIS, PC A03/MF A01. Distribution Category STD -96
26	6:25864	NTIS, PC A02/MF A01. Order Number DE81024945, Distribution Category STD -96
28	6:25865	NTIS, PC A02/MF A01. Order Number DE81023796, Distribution Category STD -93
DOE/NASA/CR-161730	6:25340	NTIS, PC A05/MF A01. Order Number DE81024944, Distribution Category STD -59c
161756	6:25341	NTIS, PC A05/MF A01. Order Number DE81024141, Distribution Category STD -59a
DOE/NOAA/OTEC-35	6:25317	NTIS, PC A09/MF A01. Order Number DE81023736, Distribution Category STD -64
36	6:25318	NTIS, PC A04/MF A01. Order Number DE81023737, Distribution Category STD -64
38	6:25253	NTIS, PC A07/MF A01. Order Number DE81024914, Distribution Category STD -64
DOE/NWTS-80-1	6:25121	NTIS, PC A04/MF A01. Order Number DE81025615, Distribution Category MN -70
DOE/OR/03054-T5	6:24857	NTIS, PC A11/MF A01. Distribution Category MN -89
DOE/OR/06102-T1	6:25499	NTIS, PC A05/MF A01. Order Number DE81025021, Distribution Category MN -78
DOE/PC/30041-T2	6:25968	NTIS, PC A02/MF A01. Distribution Category MN -90d
DOE/PC/30080-T3	6:24858	NTIS, PC A04/MF A01. Order Number DE81025131, Distribution Category STD -90d
DOE/PC/30205-T1	6:24943	NTIS, PC A03/MF A01. Distribution Category STD -88
DOE/PC/30210-T1	6:24904	NTIS, PC A02/MF A01. Order Number DE81025150, Distribution Category MN -90c
DOE/PC/30264-06	6:24859	NTIS, PC A03/MF A01. Order Number DE81024384, Distribution Category STD -90d
DOE/PE/70278-T14	6:25041	NTIS, PC A06/MF A01. Order Number DE81025169, Distribution Category MN -98B
T15	6:26172	NTIS, PC A07/MF A01. Order Number DE81024250, Distribution Category MN -98B
DOE/R4/10185-T1	6:25084	NTIS, PC A21/MF A01. Order Number DE81024274, Distribution Category STD -91
DOE/R5/10106-3	6:25380	NTIS, PC A02/MF A01. Order Number DE81023939, Distribution Category MN -59c
DOE/R5/10112-T1	6:25342	NTIS, PC A05/MF A01. Distribution Category MN -95d
DOE/R5/10123-1	6:25377	NTIS, PC A03/MF A01. Order Number DE81023276, Distribution Category MN -59a
DOE/R5/10131-2	6:25192	NTIS, PC A02/MF A01. Order Number DE81023346, Distribution Category MN -61a
DOE/R5/10217-1	6:25193	NTIS, PC A04/MF A01. Order Number DE81025064, Distribution Category MN -61a
DOE/R9/10019-T1	6:25207	NTIS, PC A21/MF A01. Distribution Category MN -97e
T2	6:25208	NTIS, PC A05/MF A01. Distribution Category MN -97e
DOE/RA/50366-T1	6:25892	NTIS, PC A10/MF A01. Distribution Category STD -96
DOE/RG/10367-T3	6:25640	NTIS, PC A02/MF A01. Distribution Category MN -98F
DOE/RG/10446-T1	6:24969	NTIS, PC A05/MF A01. Distribution Category MN -98F
T2	6:25800	NTIS, PC A12/MF A01. Distribution Category MN -98F
DOE/SF/00893-T4	6:25491	NTIS, PC A02/MF A01. Order Number DE81025234, Distribution Category MN -79k
DOE/SF/01435-T1	6:25504	NTIS, PC A03/MF A01. Distribution Category MN -77
DOE/SF/01795-T2	6:25407	NTIS, PC A04/MF A01. Distribution Category MN -66h
DOE/SF/10499-T29	6:25298	NTIS, PC A23/MF A01. Distribution Category MN -62c
T30	6:25299	NTIS, PC A09/MF A01. Distribution Category MN -62c
T31	6:25300	NTIS, PC A04/MF A01. Distribution Category MN -62c
T33	6:25301	NTIS, PC A13/MF A01. Distribution Category MN -62c
T34	6:25302	NTIS, PC A02/MF A01. Distribution Category MN -62d
DOE/SF/11442-T1	6:25408	NTIS, PC A08/MF A01. Order Number DE81025157, Distribution Category MN -66g
DOE/SF/70030-T18	6:25492	NTIS, PC A02/MF A01. Order Number DE81025236, Distribution Category MN -79k
T19	6:25523	NTIS, PC A02/MF A01. Order Number DE81025232, Distribution Category MN -79p
DOE/SF/71032-T10	6:25524	NTIS, PC A03/MF A01. Order Number DE81025237, Distribution Category MN -79p
DOE/SF/76026-T7	6:25493	NTIS, PC A02/MF A01. Order Number DE81025235, Distribution Category MN -79k
DOE/TIC-11124	6:25801	NTIS, PC A02/MF A01. Distribution Category STD -95f
11452	6:25078	NTIS, PC A06/MF A01. Order Number DE81023259, Distribution Category STD -92
1023186	6:26087	NTIS, PC A02/MF A01. Order Number DE81023186, Distribution Category MN -97b
1025039	6:25230	NTIS, PC A07/MF A01. Distribution Category MN -58d
DOE/UMT-0102	6:26197	NTIS, PC A10/MF A01. Order Number DE81024471, Distribution Category MN -70
0102S	6:26198	NTIS, PC A05/MF A01. Order Number DE81025225, Distribution Category MN -70
0103	6:25122	NTIS, PC A11/MF A01. Order Number DE81025611, Distribution Category MN -70

Report No.	*Abstract No.*	*Availability*
0103S	6:25123	NTIS, PC A04/MF A01. Order Number DE81025610, Distribution Category MN -70
DP-		
1556	6:26165	NTIS, PC A06/MF A01. Order Number DE81026336, Distribution Category MN -11
DP-MS-		
81-1	6:26317	NTIS, PC A02/MF A01. Order Number DE81023043, Distribution Category MN -41
81-64	6:26294	NTIS, PC A05/MF A01. Order Number DE81025594, Distribution Category MN -48
DP-TR-		
19	6:26002	NTIS, PC A02/MF A01. Order Number DE81024929, Distribution Category MN -4
DPST-		
80-466	6:25124	NTIS, PC A05/MF A01. Order Number DE81025593, Distribution Category MN -70
EGG-M-		
01981	6:25903	NTIS, PC A03/MF A01. Order Number DE81024591, Distribution Category MN -79h
EMD-		
2-65-1202	6:25198	*See* NP-1903403
81-36	6:25636	General Accounting Office, Gaithersburg, MD. Order Number DE81903693, Distribution Category MN -13
81-57	6:25633	General Accounting Office, Washington, DC. Order Number DE81903695, Distribution Category MN -98B
ENDF-		
308	6:26581	*See* ORNL/TM-7752
ENICO-		
1086	6:25125	NTIS, PC A03/MF A01. Order Number DE81024407, Distribution Category STD -70
EPA/600/3-		
81-027	6:26195	*See* DOE/DP/00539-040
81-035	6:26196	*See* DOE/DP/00539-042
EPA/600/9-		
81-019B	6:24926	NTIS. Order Number DE81903401, Distribution Category MN -11
81-019B	6:24927	NTIS
81-019B	6:24928	NTIS
81-019B	6:25840	NTIS
EPRI-AP-		
1623-Vol.2	6:25440	NTIS, PC A10/MF A01. Distribution Category MN -90f
1803	6:24860	NTIS, PC A14/MF A01. Distribution Category MN -90f
1827	6:24861	NTIS, PC A06/MF A01. Distribution Category MN -90d
1849	6:25441	NTIS, PC A05/MF A01. Distribution Category MN -90f
1864	6:25652	NTIS, PC A04/MF A01. Distribution Category MN -90g
EPRI-CS-		
1806	6:25453	NTIS, PC A14/MF A01. Order Number DE81903306, Distribution Category MN -90i
1818	6:25442	NTIS, PC A07/MF A01. Order Number DE81903305, Distribution Category MN -90f
1843	6:25454	NTIS, PC A07/MF A01. Distribution Category MN -90d
1845	6:25443	NTIS, PC A07/MF A01. Distribution Category MN -90e
1846	6:25444	NTIS, PC A05/MF A01. Order Number DE81903303, Distribution Category MN -90e
1847	6:25445	NTIS, PC A07/MF A01. Distribution Category MN -90e
EPRI-EA-		
1840	6:26323	NTIS, PC A06/MF A01. Distribution Category MN -11
1855	6:26399	NTIS, PC A15/MF A01. Distribution Category MN -11
1874	6:26324	NTIS, PC A08/MF A01. Distribution Category MN -11

Report No.	*Abstract No.*	*Availability*
EPRI-EL-		
1836	6:25802	NTIS, PC A05/MF A01. Order Number DE81903308, Distribution Category MN -97b
1854	6:25473	NTIS, PC A07/MF A01. Order Number DE81903430, Distribution Category MN -97a
1860(Vol.2)	6:25474	NTIS, PC A12/MF A01. Order Number DE81025073, Distribution Category MN -97b
1860(Vol.3)	6:25475	NTIS, PC A15/MF A01. Order Number DE81025260, Distribution Category MN -97b
1860(Vol.4)	6:25476	NTIS, PC A17/MF A01. Order Number DE81025261, Distribution Category MN -97b
1868	6:25477	NTIS, PC A06/MF A01. Distribution Category MN -97b
1872	6:25478	NTIS, PC A13/MF A01. Order Number DE81903309, Distribution Category MN -97a
1872(Vol.2)	6:25479	NTIS, PC A05/MF A01. Distribution Category MN -97a
EPRI-EM-		
1589(Vol.6)	6:25568	NTIS, PC A10/MF A01. Order Number DE81025111, Distribution Category MN -94e
1589(Vol.7)	6:25569	NTIS, PC A11/MF A01. Order Number DE81025264, Distribution Category MN -94e
1589(Vol.8) (App.A)	6:25574	NTIS, PC A05/MF A01. Order Number DE81025112, Distribution Category MN -94e
1589(Vol.8) (App.C)	6:25210	NTIS, PC A08/MF A01. Order Number DE81025106, Distribution Category MN -94e
1589(Vol.8) (App.E)	6:25575	NTIS, PC A08/MF A01. Order Number DE81025127, Distribution Category MN -94e
1589(Vol.9) (App.B)	6:25570	NTIS, PC A07/MF A01. Order Number DE81025108, Distribution Category MN -94e
1589(Vol.9) (App.E)	6:25571	NTIS, PC A07/MF A01. Order Number DE81025262, Distribution Category MN -94e
1589(Vol.10)	6:25576	NTIS, PC A16/MF A01. Order Number DE81025107, Distribution Category MN -94e
1589(Vol.13)	6:25213	NTIS, PC A09/MF A01. Order Number DE81025110, Distribution Category MN -94e
1866(Vol.2)	6:25343	NTIS, PC A11/MF A01. Distribution Category MN -59
EPRI-NP-		
1824	6:24862	NTIS, PC A03/MF A01. Distribution Category MN -90f
1858	6:25503	NTIS, PC A08/MF A01. Distribution Category MN -38
EPRI-WS-		
80-127	6:24958	NTIS, PC A09/MF A01. Order Number DE81903488, Distribution Category MN -90h
80-127	6:24959	NTIS, PC A09/MF A01
80-127	6:24960	NTIS, PC A09/MF A01
80-127	6:24961	NTIS, PC A09/MF A01
80-127	6:24962	NTIS, PC A09/MF A01
80-127	6:24963	NTIS, PC A09/MF A01
80-127	6:25061	NTIS, PC A09/MF A01
80-127	6:25062	NTIS, PC A09/MF A01
80-127	6:25063	NTIS, PC A09/MF A01
80-127	6:25064	NTIS, PC A09/MF A01
80-127	6:25065	NTIS, PC A09/MF A01
80-127	6:25446	NTIS, PC A09/MF A01
80-127	6:25447	NTIS, PC A09/MF A01
80-127	6:25455	NTIS, PC A09/MF A01
80-127	6:25456	NTIS, PC A09/MF A01
80-127	6:25457	NTIS, PC A09/MF A01
80-127	6:25458	NTIS, PC A09/MF A01
ESD-		
1671	6:26287	*See* ORNL/TM-7564
EUR-		
6851-EN	6:25730	Luxembourg; Commission of the European Communities (1981).
7134-EN	6:25803	Luxembourg; Commission of the European Communities (1981).

Report No.	Abstract No.	Availability
FBDU-		
360-06	6:25122	*See* DOE/UMT-0103
360-06S	6:25123	*See* DOE/UMT-0103S
FCR-		
1784	6:25666	*See* DOE/NASA/0126-1
FE-		
2315-60	6:24863	NTIS, PC A02/MF A01. Distribution Category STD -90d
2542-37	6:24848	*See* DOE/ET/13060-T4
2542-38(Vol.2)	6:24843	*See* DOE/ET/13060-T3(Vol.2)
2542-38(Vol.6)	6:24844	*See* DOE/ET/13060-T3(Vol.6)
2542-38(Vol.7)	6:24845	*See* DOE/ET/13060-T3(Vol.7)
2542-38(Vol.12)	6:24846	*See* DOE/ET/13060-T3(Vol.12)
2542-38(Vol.13)	6:24847	*See* DOE/ET/13060-T3(Vol.13)
2595-6	6:24864	NTIS, PC A03/MF A01. Distribution Category STD -90d
FERMILAB-Conf-		
81/ 40-EXP	6:26077	NTIS, PC A02/MF A01. Distribution Category MN -37
GA-A-		
14847	6:26693	NTIS, PC A04/MF A01. Order Number DE81025223, Distribution Category STD -20
16001	6:25946	NTIS, PC A02/MF A01. Distribution Category MN -80
16148	6:26718	NTIS, PC A02/MF A01. Order Number DE81025140, Distribution Category MN -32
16161	6:26020	NTIS, PC A03/MF A01. Distribution Category MN -38
16234	6:25485	NTIS, PC A02/MF A01. Distribution Category MN -77
16269	6:25486	NTIS, PC A02/MF A01. Distribution Category MN -77
16270	6:25948	NTIS, PC A03/MF A01. Order Number DE81025224, Distribution Category STD -77
GEND-		
001	6:25525	NTIS, PC A99/MF A01. Order Number DE81025533, Distribution Category MN -78
GESP-		
785	6:25823	NTIS, PC A03/MF A01. Order Number DE81024309, Distribution Category MN -93
813	6:25075	NTIS, PC A02/MF A01. Distribution Category MN -92
GJBX-		
171-81	6:25090	NTIS, PC A09/MF A01. Order Number DE81025023, Distribution Category MN -51
172-81	6:25091	NTIS, PC E01/MF, $3.50. Order Number DE81025004, Distribution Category MN -51
179-81-Vol.1	6:25092	NTIS, PC A05/MF A01. Order Number DE81025928, Distribution Category MN -51
179-81-Vol.2A	6:25093	NTIS, PC A08/MF A01. Order Number DE81025697, Distribution Category MN -51
179-81-Vol.2B	6:25094	NTIS, PC A09/MF A01. Order Number DE81025698, Distribution Category MN -51
179-81-Vol.2C	6:25095	NTIS, PC A12/MF A01. Order Number DE81025694, Distribution Category MN -51
179-81-Vol.2D	6:25096	NTIS, PC A08/MF A01. Order Number DE81025699, Distribution Category MN -51
180-81-Vol.1	6:25097	NTIS, PC A05/MF A01. Order Number DE81025930, Distribution Category MN -51
GT-		
27041-4	6:25409	NTIS, PC A05/MF A01. Order Number DE81024362, Distribution Category MN -66g
HEDL-SA-		
2105-FP	6:25509	NTIS, PC A02/MF A01. Order Number DE81023937, Distribution Category MN -79p
2137	6:25904	NTIS, PC A02/MF A01. Order Number DE81025303, Distribution Category MN -4
2194	6:25510	NTIS, PC A02/MF A01. Order Number DE81024088, Distribution Category MN -79e
2203-FP	6:25494	NTIS, PC A02/MF A01. Order Number DE81024113, Distribution Category MN -79g
2300	6:25511	NTIS, PC A02/MF A01. Order Number DE81023933, Distribution Category MN -79g
2302	6:26166	NTIS, PC A02/MF A01. Order Number DE81024096, Distribution Category MN -11
2303-FP	6:25501	NTIS, PC A03/MF A01. Order Number DE81024089, Distribution Category MN -80
2316-FP	6:25512	NTIS, PC A02/MF A01. Order Number DE81024310, Distribution Category MN -79b
2322-FP	6:25500	NTIS, PC A02/MF A01. Order Number DE81024104, Distribution Category MN -78
2323	6:25502	NTIS, PC A02/MF A01. Order Number DE81024103, Distribution Category MN -80
2329-FP	6:25526	NTIS, PC A02/MF A01. Order Number DE81024107, Distribution Category MN -79p
2332-FP	6:25099	NTIS, PC A02/MF A01. Order Number DE81024095, Distribution Category MN -79b
2373-FP	6:25513	NTIS, PC A02/MF A01. Order Number DE81024111, Distribution Category MN -79p
2405-FP	6:25495	NTIS, PC A02/MF A01. Order Number DE81024109, Distribution Category MN -79b
HUD-PDR-		
548	6:25344	NTIS, PC A07/MF A01. Order Number DE81025037, Distribution Category MN -98D
589	6:25345	NTIS, PC A06/MF A01. Order Number DE81025022, Distribution Category MN -98D
664	6:25346	NTIS, PC A13/MF A01. Order Number DE81025036, Distribution Category MN -98D
IAEA-SM-		
254/ 30	6:24905	*See* MLM-2829(OP)
254/ 63	6:26192	NTIS, PC A03/MF A01. Order Number DE81024127, Distribution Category MN -41
IDO-		
1009(Vol.1) App.L	6:25209	*See* DOE/ID/01570-T21(Vol.1)
10094(Vol2) App.A-K	6:25211	*See* DOE/ID/01570-T21(Vol.2)App.A-K
10094(Vol.3) App.L	6:25212	*See* DOE/ID/01570-T21(Vol.3)App.L
IS-		
4762	6:25905	NTIS, PC A06/MF A01. Order Number DE81023616, Distribution Category MN -25
4768	6:26167	NTIS, PC A04/MF A01. Order Number DE81025525, Distribution Category MN -20e
4773	6:24929	NTIS, PC A03/MF A01. Order Number DE81025523, Distribution Category MN -90
IS-M-		
309	6:24933	NTIS, PC A02/MF A01. Order Number DE81023777, Distribution Category MN -90i
311	6:24948	NTIS, PC A02/MF A01. Order Number DE81023786, Distribution Category MN -90b
315	6:25906	NTIS, PC A02/MF A01. Order Number DE81023756, Distribution Category MN -25
316	6:25979	NTIS, PC A02/MF A01. Order Number DE81023793, Distribution Category MN -4
317	6:24866	NTIS, PC A02/MF A01. Order Number DE81023789, Distribution Category MN -90b
318	6:24867	NTIS, PC A03/MF A01. Order Number DE81023741, Distribution Category MN -90b

Report No.	*Abstract No.*	*Availability*
319	6:25907	NTIS, PC A02/MF A01. Order Number DE81023790, Distribution Category MN -25
320	6:26603	NTIS, PC A02/MF A01. Order Number DE81023788, Distribution Category MN -34C
328	6:26045	NTIS, PC A03/MF A01. Order Number DE81024003, Distribution Category MN -38
ISPO-		
134	6:25174	*See* UCRL-53145
JPRS-		
78269	6:26715	NTIS. Distribution Category MN -13
K/OA-		
5001	6:25172	NTIS, PC A03/MF A01. Distribution Category MN -15
K/UR-		
313	6:25091	*See* GJBX-172-81
320	6:25090	*See* GJBX-171-81
LA-		
8746-MS	6:25949	NTIS, PC A02/MF A01. Order Number DE81024031, Distribution Category STD -25
8753MS	6:26694	NTIS, PC A02/MF A01. Order Number DE81024051, Distribution Category STD -20f
8784-MS	6:26633	NTIS, PC A02/MF A01. Distribution Category STD -20b
8814-MS	6:26078	NTIS, PC A02/MF A01. Order Number DE81024054, Distribution Category STD -37
8828-MS	6:26634	NTIS, PC A02/MF A01. Distribution Category STD -20f
8829-MS	6:26695	NTIS, PC A02/MF A01. Order Number DE81024057, Distribution Category STD -20b
8856-MS	6:25514	NTIS, PC A02/MF A01. Order Number DE81023982, Distribution Category STD -46
LA-tr-		
81-10	6:25989	NTIS, PC A02/MF A01. Distribution Category MN -4
LA-UR-		
80-3457	6:26719	NTIS, PC A02/MF A01. Distribution Category MN -32
80-3642	6:26720	NTIS, PC A02/MF A01. Distribution Category MN -32
80-3716	6:26721	NTIS, PC A02/MF A01. Distribution Category MN -32
81-852	6:25399	NTIS, PC A02/MF A01. Distribution Category MN -66a
81-1017	6:25950	NTIS, PC A02/MF A01. Distribution Category MN -34
81-1044	6:25951	NTIS, PC A02/MF A01. Distribution Category MN -25
81-1050	6:25177	NTIS, PC A02/MF A01. Order Number DE81017361, Distribution Category MN -4
81-1054	6:25670	NTIS, PC A02/MF A01. Distribution Category MN -96
81-1265	6:25400	NTIS, PC A02/MF A01. Distribution Category MN -66a
81-1371	6:25527	NTIS, PC A02/MF A01. Distribution Category MN -33
81-1395	6:26696	NTIS, PC A02/MF A01. Distribution Category MN -21
81-1416	6:26697	NTIS, PC A02/MF A01. Distribution Category MN -20d
81-1498	6:25528	NTIS, PC A02/MF A01. Distribution Category MN -78
81-1519	6:25529	NTIS, PC A02/MF A01. Distribution Category MN -78
81-1520	6:25530	NTIS, PC A02/MF A01. Distribution Category MN -78
81-1521	6:25531	NTIS, PC A02/MF A01. Distribution Category MN -78
81-1556	6:25532	NTIS, PC A02/MF A01. Distribution Category MN -78
81-1566	6:26698	NTIS, PC A03/MF A01. Distribution Category MN -21
81-1593	6:26589	NTIS, PC A02/MF A01. Distribution Category MN -34C
81-1601	6:26635	NTIS, PC A02/MF A01. Distribution Category MN -38
81-1611	6:26636	NTIS, PC A02/MF A01. Distribution Category MN -21
81-1641	6:26699	NTIS, PC A02/MF A01. Distribution Category MN -20d
81-1659	6:25080	NTIS, PC A02/MF A01. Order Number DE81025290, Distribution Category MN -91
81-1712	6:26609	NTIS, PC A02/MF A01. Order Number DE81025255, Distribution Category MN -34
81-1721	6:26590	NTIS, PC A02/MF A01. Order Number DE81025256, Distribution Category MN -34C
81-1962	6:26021	NTIS, PC A02/MF A01. Order Number DE81025364, Distribution Category MN -38
LBL-		
10881	6:26148	NTIS, PC A03/MF A01. Order Number DE81023241, Distribution Category MN -11
10909	6:26475	NTIS, PC A04/MF A01. Order Number DE81025116, Distribution Category MN -32
11833	6:25319	NTIS, PC A02/MF A01. Order Number DE81023046, Distribution Category MN -64
11896	6:24934	NTIS, PC A02/MF A01. Distribution Category MN -91
12076	6:25401	NTIS, PC A09/MF A01
12076	6:25402	NTIS, PC A09/MF A01
12076	6:26096	NTIS, PC A09/MF A01
12076	6:26404	NTIS, PC A09/MF A01. Distribution Category STD -70
12076	6:26405	NTIS, PC A09/MF A01
12076	6:26406	NTIS, PC A09/MF A01
12076	6:26407	NTIS, PC A09/MF A01
12076	6:26408	NTIS, PC A09/MF A01
12076	6:26409	NTIS, PC A09/MF A01
12076	6:26410	NTIS, PC A09/MF A01
12076	6:26411	NTIS, PC A09/MF A01
12076	6:26412	NTIS, PC A09/MF A01
12076	6:26413	NTIS, PC A09/MF A01
12076	6:26414	NTIS, PC A09/MF A01
12076	6:26415	NTIS, PC A09/MF A01
12076	6:26428	NTIS, PC A09/MF A01
12278	6:24868	NTIS, PC A09/MF A01. Order Number DE81025158, Distribution Category MN -4
12380	6:26079	NTIS, PC A03/MF A01. Distribution Category MN -37
12454	6:26454	NTIS, PC A03/MF A01. Order Number DE81023025, Distribution Category MN -34A
12558	6:26520	NTIS, PC A05/MF A01. Distribution Category MN -34D
12589	6:26400	NTIS, PC A04/MF A01. Distribution Category STD -41
12595	6:25841	NTIS, PC A03/MF A01. Order Number DE81023202, Distribution Category MN -95d
12596	6:26574	NTIS, PC A03/MF A01. Order Number DE81025329, Distribution Category MN -34C
12657	6:25588	NTIS, PC A02/MF A01. Order Number DE81023030, Distribution Category MN -94cb
12754	6:25671	NTIS, PC A02/MF A01. Order Number DE81023245, Distribution Category MN -93
12761	6:25980	NTIS, PC A03/MF A01. Order Number DE81023029, Distribution Category MN -4
12767	6:26011	NTIS, PC A02/MF A01. Distribution Category MN -38
12797	6:26071	NTIS, PC A02/MF A01. Order Number DE81023050, Distribution Category MN -28
12840	6:26521	NTIS, PC A05/MF A01. Order Number DE81025327, Distribution Category MN -34
LMSC-D-		
767601	6:25316	*See* DOE/ET/21056-T3
MCR-		
78-1331A	6:25303	NTIS, PC A03/MF A01. Order Number DE81024308, Distribution Category MN -62c
80-1369A-Vol.1	6:25307	*See* SAND-79-8192/1

Report No.	Abstract No.	Availability
MDC-G-		
8221	6:25299	*See* DOE/SF/10499-T30
8255	6:25301	*See* DOE/SF/10499-T33
8273	6:25298	*See* DOE/SF/10499-T29
8527	6:25305	*See* SAN-0499-53
8561	6:25300	*See* DOE/SF/10499-T31
9330	6:25304	NTIS, PC A09/MF A01. Distribution Category MN -62c
MHSMP-		
81-28	6:26097	NTIS, PC A02/MF A01. Distribution Category MN -45
81-29	6:26098	NTIS, PC A02/MF A01. Order Number DE81024410, Distribution Category MN -45
MLM-		
2817(OP)	6:25981	NTIS, PC A02/MF A01. Distribution Category MN -4
2829(OP)	6:24905	NTIS, PC A02/MF A01. Distribution Category MN -90i
2831(OP)	6:25067	NTIS, PC A02/MF A01. Distribution Category MN -92a
2840(OP)	6:25969	NTIS, PC A02/MF A01. Order Number DE81024317, Distribution Category MN -15
2841(OP)	6:26722	NTIS, PC A02/MF A01. Distribution Category MN -25
2842(OP)	6:25102	NTIS, PC A02/MF A01. Distribution Category MN -15
MLM-MU-		
81-62-0007	6:24869	NTIS, PC A12/MF A01. Order Number DE81025162, Distribution Category MN -90c
NASA-CR-		
165139	6:25862	*See* DOE/NASA/0008-12
165206	6:25579	*See* DOE/NASA/0138-1
165260	6:25666	*See* DOE/NASA/0126-1
165262	6:25875	*See* DOE/NASA/0226-1
165286	6:25297	*See* DOE/NASA/0180-1
165303	6:25667	*See* DOE/NASA/0201-2
NASA-TM-		
81752	6:26010	*See* DOE/NASA/2593-27
81764	6:25651	*See* DOE/NASA/10769-14
82601	6:25421	*See* DOE/NASA/20320-31
82607	6:25669	*See* DOE/NASA/12726-8
82615	6:25876	*See* DOE/NASA/51040-25
82624	6:25864	*See* DOE/NASA/51040-26
82637	6:25865	*See* DOE/NASA/51040-28
NBSIR-		
80-2145(DOE)	6:25720	NTIS, PC A06/MF A01. Order Number DE81025778, Distribution Category STD -95d
NE-M-		
5-23T(4/ 81) (Rev.)	6:25498	Nuclear Standards Management Center, Oak Ridge, TN. Distribution Category STD -80
NP-		
1903403	6:25198	New Mexico Energy and Minerals Department, Santa Fe. Order Number DE81903403, Distribution Category MN -98G
1903422	6:25731	Sacramento, CA; California Energy Commission (1981).
1903450	6:25609	Austin, TX; Bureau of Economic Geology (1980).
NUREG-		
0738	6:25533	NTIS, PC A03/MF A01
NUREG/CR-		
1492	6:25534	NTIS, PC A04/MF A01
1509	6:25535	NTIS, PC A07/MF A01
1581-V-1	6:25459	NTIS, PC A21/MF A01
1581-V-2	6:25460	NTIS, PC A19/MF A01
1581-V-3	6:25461	NTIS, PC A02/MF A01
1621	6:26416	NTIS, PC A14/MF A01
1629	6:25536	NTIS, PC A99/MF A01
1643	6:26419	NTIS, PC A08/MF A01
1668	6:26080	NTIS, PC A06/MF A01
NVO-		
196-17-Rev.1	6:25126	NTIS, PC A03/MF A01. Order Number DE81025614, Distribution Category STD -70
196-22	6:25127	NTIS, PC A06/MF A01. Distribution Category STD -70
196-23	6:25128	NTIS, PC A05/MF A01. Distribution Category STD -70
ONWI-		
9(2) (80)	6:25129	NTIS, PC A16/MF A01. Order Number DE81010320, Distribution Category STD -70
ORAU/IEA-		
81-5(M)	6:25600	NTIS, PC A05/MF A01. Order Number DE81023768, Distribution Category MN -98F
ORNL-		
5758	6:26081	NTIS, PC A14/MF A01. Order Number DE81024412, Distribution Category STD -37
ORNL/EIS-		
193	6:26323	*See* EPRI-EA-1840
ORNL-SUB-		
78/ 86993/ 1	6:25721	NTIS, PC A03/MF A01. Order Number DE81023867, Distribution Category MN -95d
ORNL/TM-		
7292	6:24964	NTIS, PC A06/MF A01. Distribution Category STD -90h
7502	6:25100	NTIS, PC A03/MF A01. Order Number DE81023853, Distribution Category STD -86
7564	6:26287	NTIS, PC A05/MF A01. Order Number DE81025895, Distribution Category MN -11
7665	6:26022	NTIS, PC A03/MF A01. Order Number DE81024150, Distribution Category STD -32
7694	6:25214	NTIS, PC A06/MF A01. Order Number DE81025857, Distribution Category STD -97e
7718	6:25396	NTIS, PC A08/MF A01. Order Number DE81025138, Distribution Category STD -66d
7721	6:26389	NTIS, PC A03/MF A01. Order Number DE81025498, Distribution Category MN -48
7728	6:26149	NTIS, PC A03/MF A01. Order Number DE81025852, Distribution Category MN -90i
7733	6:26637	NTIS, PC A03/MF A01. Order Number DE81025854, Distribution Category STD -20g
7748	6:26612	NTIS, PC A04/MF A01. Order Number DE81025851, Distribution Category MN -41
7752	6:26581	NTIS, PC A02/MF A01. Distribution Category MN -34C
7759	6:26176	NTIS, PC A06/MF A01. Order Number DE81025496, Distribution Category MN -11
7760	6:25970	NTIS, PC A02/MF A01. Order Number DE81025853, Distribution Category MN -70
7761	6:25515	NTIS, PC A03/MF A01. Order Number DE81025855, Distribution Category STD -83
7777	6:26700	NTIS, PC A15/MF A01. Order Number DE81024270, Distribution Category STD -20d
7778	6:26701	NTIS, PC A07/MF A01. Order Number DE81025126, Distribution Category STD -20
7801	6:25462	NTIS, PC A03/MF A01. Distribution Category MN -12
7818	6:26610	NTIS, PC A02/MF A01. Order Number DE81024418, Distribution Category MN -34C
7828	6:26702	NTIS, PC A02/MF A01. Order Number DE81025113, Distribution Category STD -20d
7839	6:25496	NTIS, PC A04/MF A01. Order Number DE81025856, Distribution Category STD -77
PATENTS-US-		(US: Commissioner of Patents, Washington, D.C. 20231, USA, $.50 per copy. Government Patent Applications available from NTIS)
A 153,241	6:25658	
A 159,313	6:25398	
A 162,543	6:25655	
A 163,369	6:25397	
A 174,964	6:24889	
A 177,327	6:25654	
4,250,015	6:24865	

Report No.	Abstract No.	Availability
4,252,631	6:25050	
4,252,777	6:24932	
4,252,778	6:25069	
PB-		
81-103350	6:25884	NTIS, PC A02/MF A01
81-103392	6:25641	NTIS, PC A02/MF A01
81-104879	6:25804	NTIS, PC A08/MF A01
81-105033	6:25048	NTIS, PC A02/MF A01
81-105041	6:25049	NTIS, PC A21/MF A01
81-105736	6:25722	NTIS, PC A05/MF A01
81-105819	6:25866	NTIS, PC A03/MF A01
81-105934	6:26061	NTIS, PC A12/MF A01
81-106940	6:25723	NTIS, PC A04/MF A01
81-107575	6:25842	NTIS, PC A04/MF A01
81-109316	6:25643	NTIS, PC A08/MF A01
81-109555	6:25867	NTIS, PC A05/MF A01
81-109621	6:25422	NTIS, PC A03/MF A01
81-109688	6:24950	NTIS, PC A05/MF A01
81-109720	6:25463	NTIS, PC A03/MF A01
81-109761	6:25868	NTIS, PC A14/MF A01
81-110249	6:25464	NTIS, PC A06/MF A01
81-110256	6:25448	NTIS, PC A11/MF A01
81-110322	6:25642	NTIS, PC A04/MF A01
81-110868	6:24951	NTIS, PC A06/MF A01
81-110918	6:25843	NTIS, PC A07/MF A01
81-110959	6:25184	NTIS, PC A09/MF A01
81-111114	6:25395	NTIS, PC A09/MF A01
81-111148	6:26150	NTIS, PC A02/MF A01
81-111247	6:26151	NTIS, PC A02/MF A01
81-111312	6:25465	NTIS, PC A08/MF A01
81-111387	6:24870	NTIS, PC A02/MF A01
81-111395	6:24871	NTIS, PC A02/MF A01
81-111460	6:26152	NTIS, PC A06/MF A01
81-111536	6:26153	NTIS, PC A04/MF A01
81-111585	6:24906	NTIS, PC A12/MF A01
81-111593	6:24935	NTIS, PC A12/MF A01
81-112435	6:25466	NTIS, PC A06/MF A01
81-112641	6:25195	NTIS, PC A11/MF A01
81-112757	6:25467	NTIS, PC A99/MF A01
81-112898	6:26154	NTIS, PC A06/MF A01
81-113003	6:24936	NTIS, PC A05/MF A01
81-113151	6:25449	NTIS, PC A10/MF A01
81-113177	6:25254	NTIS, PC A05/MF A01
81-113185	6:25255	NTIS, PC A06/MF A01
81-113292	6:25071	NTIS, PC A03/MF A01
81-113391	6:25601	NTIS, PC A04/MF A01
81-113615	6:24937	NTIS, PC A04/MF A01
81-113623	6:26155	NTIS, PC A05/MF A01
81-113656	6:25724	NTIS, PC A05/MF A01
81-113664	6:24938	NTIS, PC A03/MF A01
81-113672	6:25672	NTIS, PC A10/MF A01
81-113706	6:25805	NTIS, PC A24/MF A01
81-113920	6:26156	NTIS, PC A03/MF A01
81-113946	6:24939	NTIS, PC A07/MF A01
81-113953	6:24952	NTIS, PC A07/MF A01
81-114043	6:24930	NTIS, PC A06/MF A01
81-114092	6:25085	NTIS, PC A21/MF A01
81-114225	6:25593	NTIS, PC A06/MF A01
81-114233	6:25594	NTIS, PC A05/MF A01
81-114241	6:25595	NTIS, PC A07/MF A01
81-114258	6:25066	NTIS, PC A04/MF A01
81-114266	6:25596	NTIS, PC A07/MF A01
81-114274	6:25597	NTIS, PC A15/MF A01
81-114290	6:24872	NTIS, PC A03/MF A01
81-114308	6:24940	NTIS, PC A08/MF A01
81-114381	6:26157	Source tape is in EBCDIC character set. Tapes can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions. Price includes documentation, PB80-184575.
81-114530	6:25725	NTIS, PC A18/MF A01
81-114555	6:24941	NTIS, PC A06/MF A01
81-114605	6:25605	NTIS, PC A09/MF A01
81-114670	6:26158	NTIS, PC A04/MF A01
81-114720	6:25869	NTIS, PC A04/MF A01
81-114738	6:26159	NTIS, PC A10/MF A01
81-114746	6:26325	NTIS, PC A04/MF A01
81-114753	6:25755	NTIS, PC A06/MF A01
81-114852	6:25602	NTIS PCMF A01
81-114894	6:25603	NTIS PCMF A01
81-114969	6:26106	NTIS PCMF A01
81-115081	6:25870	NTIS, PC A04/MF A01
81-115099	6:25871	NTIS, PC A03/MF A01
81-115107	6:25872	NTIS, PC A09/MF A01
81-115123	6:25076	NTIS, PC A02/MF A01
81-115610	6:26326	NTIS, PC A04/MF A01
81-115651	6:24942	NTIS, PC A02/MF A01
81-115677	6:26288	NTIS, PC A02/MF A01
81-115792	6:25806	NTIS, PC A07/MF A01
81-116055	6:25468	NTIS, PC A03/MF A01
81-116097	6:26171	NTIS, PC A04/MF A01
81-116774	6:26199	NTIS, PC A24/MF A01
81-116857	6:26295	NTIS, PC A09/MF A01
81-117160	6:25042	NTIS, PC A04/MF A01
81-118333	6:26298	NTIS, PC A05/MF A01
81-118630	6:25873	NTIS, PC A06/MF A01
81-118721	6:25606	NTIS, PC A04/MF A01
81-118739	6:26173	NTIS, PC A06/MF A01
81-118747	6:26174	NTIS, PC A02/MF A01
81-118994	6:26160	NTIS, PC A03/MF A01
81-119075	6:25469	NTIS, PC A99/MF A01
81-119166	6:25874	NTIS, PC A04/MF A01
81-119273	6:26327	NTIS, PC A04/MF A01
81-119422	6:25470	NTIS, PC A02/MF A01
81-119455	6:26175	NTIS, PC A20/MF A01
81-119737	6:25450	NTIS, PC A10/MF A01
81-120578	6:26107	NTIS, PC A03/MF A01
81-800112	6:25631	NTIS PCN01/MF N01
81-800203	6:26390	NTIS PCN01/MF N01
PNE-		
81-149	6:25497	NTIS, PC A02/MF A01. Distribution Category MN -79d
PNL-		
3000-9	6:25130	NTIS, PC A08/MF A01. Order Number DE81025531, Distribution Category MN -70
3212	6:26177	NTIS, PC A04/MF A01. Order Number DE81025119, Distribution Category MN -11
3451	6:25412	NTIS, PC A07/MF A07. Order Number DE81025105, Distribution Category MN -60
3452	6:25413	NTIS, PC A09/MF A01. Order Number DE81025104, Distribution Category MN -60
3470	6:25572	NTIS, PC A06/MF A01. Order Number DE81025774, Distribution Category STD -94e
3622	6:25423	NTIS, PC A13/MF A01. Order Number DE81025516, Distribution Category MN -60
3667	6:25414	NTIS, PC A05/MF A01. Order Number DE81025102, Distribution Category MN -60
3668	6:25415	NTIS, PC A07/MF A01. Order Number DE81025103, Distribution Category MN -60
3669	6:25416	NTIS, PC A07/MF A01. Order Number DE81025100, Distribution Category MN -60
3671	6:25417	NTIS, PC A05/MF A01. Order Number DE81025099, Distribution Category MN -60
3672	6:25418	NTIS, PC A03/MF A01. Order Number DE81025098, Distribution Category MN -60
3673	6:25419	NTIS, PC A03/MF A01. Order Number DE81025101, Distribution Category MN -60
3678	6:25131	NTIS, PC A03/MF A01. Distribution Category MN -70
3700Pt.2Suppl.	6:26391	NTIS, PC A02/MF A01. Distribution Category MN -11
3742	6:25132	NTIS, PC A11/MF A01. Distribution Category MN -70
3752	6:25133	NTIS, PC A08/MF A01. Order Number DE81025226, Distribution Category MN -70
3771	6:25424	NTIS, PC A03/MF A01. Order Number DE81025114, Distribution Category MN -60
3789	6:25165	NTIS, PC A03/MF A01. Order Number DE81023699, Distribution Category MN -70
3804	6:25573	NTIS, PC A10/MF A01. Order Number DE81024405, Distribution Category STD -94e

Report No.	Abstract No.	Availability
PNL-SA-		
9102	6:25134	NTIS, PC A02/MF A01. Distribution Category MN -25
9255	6:25909	NTIS, PC A02/MF A01. Distribution Category MN -25
PPPL-		
1773	6:26638	NTIS, PC A03/MF A01. Distribution Category STD -20f
1787	6:26639	NTIS, PC A03/MF A01. Order Number DE81024074, Distribution Category STD -20a
1788	6:26640	NTIS, PC A02/MF A01. Order Number DE81023974, Distribution Category STD -20g
1789	6:26641	NTIS, PC A02/MF A01. Order Number DE81023149, Distribution Category STD -20
1797	6:26703	NTIS, PC A03/MF A01. Order Number DE81023973, Distribution Category STD -20f
1803	6:26704	NTIS, PC A02/MF A01. Order Number DE81023134, Distribution Category STD -20d
1804	6:26642	NTIS, PC A02/MF A01. Order Number DE81023962, Distribution Category STD -20g
1809	6:26705	NTIS, PC A02/MF A01. Order Number DE81023971, Distribution Category STD -20d
PPPL-Q-		
38	6:26643	NTIS, PC A05/MF A01. Distribution Category MN -20
RFP-		
3159	6:25169	NTIS, PC A04/MF A01. Order Number DE81024409, Distribution Category STD -70
RHO-BWI-C-		
56	6:26417	NTIS, PC A23/MF A01. Distribution Category MN -11
94	6:25135	NTIS, PC A08/MF A01. Order Number DE81025779, Distribution Category MN -70
RHO-BWI-CD-		
51(Rev.2)	6:25136	NTIS, PC A11/MF A01. Order Number DE81025606, Distribution Category MN -70
RHO-BWI-SA-		
64	6:25137	NTIS, PC A03/MF A01. Order Number DE81024439, Distribution Category MN -70
67	6:26429	NTIS, PC A03/MF A01. Order Number DE81024400, Distribution Category MN -11
RHO-C-		
50	6:25138	NTIS, PC A02/MF A01. Order Number DE81025583, Distribution Category MN -70
RHO-CD-		
80-615	6:25139	NTIS, PC A05/MF A01. Order Number DE81024397, Distribution Category MN -70
RHO-LD-		
49	6:25140	NTIS, PC A04/MF A01. Order Number DE81025582, Distribution Category MN -70
RHO-SA-		
221	6:25141	NTIS, PC A05/MF A01. Order Number DE81025508, Distribution Category MN -70
SAI-		
026-79-855-LJ	6:25726	NTIS, PC A03/MF A01. Order Number DE81025624, Distribution Category MN -95d
026-79-858-LJ	6:25727	NTIS, PC A08/MF A01. Order Number DE81025230, Distribution Category MN -95d
444-80-533-LJ	6:25807	NTIS, PC A05/MF A01. Distribution Category MN -95d
SAN-		
0499-25	6:25299	*See* DOE/SF/10499-T30
0499-28	6:25298	*See* DOE/SF/10499-T29
0499-47	6:25301	*See* DOE/SF/10499-T33
0499-53	6:25305	NTIS, PC A08/MF A01. Distribution Category MN -62c
0499-63	6:25300	*See* DOE/SF/10499-T31
0499-78	6:25304	*See* MDC-G-9330
1795-9	6:25407	*See* DOE/SF/01795-T2

Report No.	Abstract No.	Availability
SAND-		
79-8189	6:25306	NTIS, PC A09/MF A01. Distribution Category MN -62d
79-8192/ 1	6:25307	NTIS, PC A09/MF A01. Order Number DE81025027, Distribution Category MN -62d
80-0019C	6:25937	NTIS, PC A02/MF A01. Order Number DE81023165, Distribution Category MN -25
80-0732	6:25910	NTIS, PC A03/MF A01. Order Number DE81025890, Distribution Category MN -25
80-1132	6:26051	NTIS, PC A02/MF A01. Order Number DE81024492, Distribution Category MN -38
80-1935	6:25142	NTIS, PC A04/MF A01. Order Number DE81025889, Distribution Category MN -70
80-1952	6:26723	NTIS, PC A03/MF A01. Order Number DE81025318, Distribution Category MN -37
80-2500	6:26706	NTIS, PC A09/MF A01. Order Number DE81025316, Distribution Category STD -21
80-2594C	6:25982	NTIS, PC A02/MF A01. Order Number DE81023180, Distribution Category MN -4
80-2602C	6:26724	NTIS, PC A03/MF A01. Order Number DE81024070, Distribution Category MN -34
80-2689C	6:26088	NTIS, PC A02/MF A01. Distribution Category MN -38
80-2694C	6:26614	NTIS, PC A02/MF A01. Order Number DE81023747, Distribution Category MN -34
80-2800C	6:25911	NTIS, PC A02/MF A01. Order Number DE81023750, Distribution Category MN -25
80-2836C	6:25940	NTIS, PC A02/MF A01. Order Number DE81024083, Distribution Category MN -25
80-2847C	6:25912	NTIS, PC A02/MF A01. Order Number DE81024080, Distribution Category MN -25
80-2864C	6:25913	NTIS, PC A02/MF A01. Order Number DE81024064, Distribution Category MN -25
80-2865C	6:26023	NTIS, PC A02/MF A01. Order Number DE81024077, Distribution Category MN -38
80-2867C	6:25382	NTIS, PC A02/MF A01. Distribution Category MN -62
80-7057	6:25403	NTIS, PC A10/MF A01. Distribution Category STD -66c
80-7154/ 1	6:25404	NTIS, PC A07/MF A01. Order Number DE81026039, Distribution Category MN -66
80-7154/ 2	6:25405	NTIS, PC A22/MF A01. Order Number DE81026040, Distribution Category MN -66
80-8053	6:26725	NTIS, PC A02/MF A01. Order Number DE81024266, Distribution Category MN -32
80-8190	6:25308	NTIS, PC A10/MF A01. Order Number DE81024263, Distribution Category MN -62d
81-0041C	6:25914	NTIS, PC A02/MF A01. Order Number DE81023178, Distribution Category MN -25
81-0050C	6:26062	NTIS, PC A02/MF A01. Order Number DE81023680, Distribution Category MN -38
81-0106	6:25537	NTIS, PC A04/MF A01. Order Number DE81025007, Distribution Category MN -38
81-0108C	6:25915	NTIS, PC A02/MF A01. Order Number DE81023748, Distribution Category MN -25
81-0156C	6:25971	NTIS, PC A02/MF A01. Order Number DE81023304, Distribution Category MN -4
81-0226C	6:25589	NTIS, PC A02/MF A01. Distribution Category MN -63d
81-0353C	6:25538	NTIS, PC A02/MF A01. Distribution Category MN -80

Report No.	Abstract No.	Availability
81-0477C	6:26707	NTIS, PC A02/MF A01. Order Number DE81024916, Distribution Category MN -21
81-0586C	6:25173	NTIS, PC A02/MF A01. Distribution Category MN -78
81-0599C	6:26708	NTIS, PC A02/MF A01. Order Number DE81023742, Distribution Category MN -21
81-0627	6:26726	NTIS, PC A02/MF A01. Order Number DE81025249, Distribution Category MN -32
81-0640	6:26403	NTIS, PC A04/MF A01. Order Number DE81025319, Distribution Category MN -41
81-0650C	6:26089	NTIS, PC A02/MF A01. Distribution Category MN -37
81-0695C	6:26709	NTIS, PC A02/MF A01. Distribution Category MN -34
81-0750C	6:26710	NTIS, PC A02/MF A01. Order Number DE81023679, Distribution Category MN -21
81-0751C	6:26711	NTIS, PC A02/MF A01. Order Number DE81023681, Distribution Category MN -21
81-0764	6:25219	NTIS, PC A02/MF A01. Order Number DE81025014, Distribution Category STD -59
81-0810	6:26024	NTIS, PC A03/MF A01. Order Number DE81024491, Distribution Category MN -38
81-0844C	6:26072	NTIS, PC A02/MF A01. Distribution Category MN -34
81-0856	6:26430	NTIS, PC A02/MF A01. Order Number DE81024046, Distribution Category MN -70
81-0859	6:26727	NTIS, PC A02/MF A01. Order Number DE81025891, Distribution Category MN -32
81-0882C	6:25035	NTIS, PC A02/MF A01. Distribution Category MN -92a
81-0925	6:25143	NTIS, PC A05/MF A01. Order Number DE81025250, Distribution Category MN -70
81-0969C	6:25983	NTIS, PC A02/MF A01. Distribution Category MN -4
81-1065	6:26620	NTIS, PC A03/MF A01. Order Number DE81025118, Distribution Category MN -2
81-1164C	6:25256	NTIS, PC A02/MF A01. Order Number DE81023179, Distribution Category MN -63
81-1315C	6:25952	NTIS, PC A02/MF A01. Order Number DE81023168, Distribution Category MN -25
81-1347C	6:24873	NTIS, PC A02/MF A01. Order Number DE81023306, Distribution Category MN -90h
81-1350C	6:25992	NTIS, PC A02/MF A01. Order Number DE81023172, Distribution Category MN -4
81-1352C	6:25984	NTIS, PC A02/MF A01. Order Number DE81023161, Distribution Category MN -4
81-1354C	6:25953	NTIS, PC A02/MF A01. Order Number DE81023167, Distribution Category MN -25
81-1359C	6:25607	NTIS, PC A05/MF A01. Order Number DE81024069, Distribution Category MN -41
81-1386C	6:25993	NTIS, PC A02/MF A01. Order Number DE81023166, Distribution Category MN -25
81-1455C	6:25985	NTIS, PC A02/MF A01. Order Number DE81024082, Distribution Category MN -4
81-1477C	6:26046	NTIS, PC A02/MF A01. Order Number DE81024068, Distribution Category MN -37
81-1524C	6:26712	NTIS, PC A02/MF A01. Order Number DE81024067, Distribution Category MN -32
81-1528C	6:26047	NTIS, PC A02/MF A01. Order Number DE81024066, Distribution Category MN -38
81-7017	6:25425	NTIS, PC A09/MF A01. Order Number DE81026041, Distribution Category STD -60
81-7026	6:25426	NTIS, PC A05/MF A01. Order Number DE81026042, Distribution Category STD -60
81-8006	6:25178	NTIS, PC A04/MF A01. Order Number DE81023676, Distribution Category MN -25
81-8223	6:25347	NTIS, PC A03/MF A01. Distribution Category MN -62c
81-8225	6:25580	NTIS, PC A06/MF A01. Order Number DE81025219, Distribution Category MN -94a
SERI/PR-		
622-1153	6:25185	NTIS, PC A03/MF A01. Distribution Category MN -61a
635-1239	6:25411	NTIS, PC A10/MF A01. Distribution Category MN -60
8104-3-T3	6:25257	NTIS, PC A03/MF A01. Distribution Category MN -63
8142-4-T2	6:25258	NTIS, PC A02/MF A01. Distribution Category MN -63
8279-1-T2	6:25259	NTIS, PC A03/MF A01. Distribution Category MN -63b
9131-1-T3	6:25260	NTIS, PC A02/MF A01. Order Number DE81023275, Distribution Category MN -63
9175-1-T3	6:25261	NTIS, PC A02/MF A01. Distribution Category MN -63
9272-1-T1	6:25262	NTIS, PC A04/MF A01. Distribution Category STD -61c
SERI/TP-		
353-467	6:25348	NTIS, PC A02/MF A01. Order Number DE81024940, Distribution Category MN -58b
631-1270	6:25320	NTIS, PC A02/MF A01. Order Number DE81024355, Distribution Category MN -64
634-1215	6:25410	NTIS, PC A02/MF A01. Order Number DE81023946, Distribution Category MN -64
641-1222	6:25349	NTIS, PC A03/MF A01. Distribution Category STD -59
753-1205	6:25220	NTIS, PC A02/MF A01. Distribution Category STD -58c
SERI/TR-		
744-876	6:25231	NTIS, PC A06/MF A01. Order Number DE81025911, Distribution Category STD -58
8002-6-T1	6:25954	NTIS, PC A05/MF A01. Distribution Category STD -61c
8085-1-T1	6:25427	NTIS, PC A02/MF A01. Distribution Category STD -60
8085-1-T2	6:25428	NTIS, PC A05/MF A01. Distribution Category STD -60
8274-1-T1	6:25263	NTIS, PC A04/MF A01. Distribution Category STD -63b
9053-1-T3	6:25264	NTIS, PC A02/MF A01. Distribution Category MN -63
98348-1	6:25350	NTIS, PC A04/MF A01. Order Number DE81024941, Distribution Category STD -59b
SLAC-PUB-		
2727	6:26728	NTIS, PC A02/MF A01. Order Number DE81025147, Distribution Category MN -34D
2738	6:26090	NTIS, PC A02/MF A01. Order Number DE81024419, Distribution Category MN -34D
SLAC-TN-		
81-2	6:26082	NTIS, PC A02/MF A01. Distribution Category MN -34D
SOLAR/0022-		
81/ 39	6:25351	NTIS, PC A06/MF A01. Order Number DE81025216, Distribution Category STD -59
SOLAR/2038-		
81/ 14	6:25352	NTIS, PC A05/MF A01. Order Number DE81024098, Distribution Category STD -59
SRO-NERP-		
3	6:26211	NTIS, PC A03/MF A01. Order Number DE81022084, Distribution Category MN -48

Report No.	Abstract No.	Availability
UCID-		
18993	6:26025	NTIS, PC A10/MF A01. Distribution Category MN -32
19000	6:25079	NTIS, PC A03/MF A01. Order Number DE81025115, Distribution Category MN -92a
19031	6:26102	NTIS, PC A02/MF A01. Order Number DE81025887, Distribution Category MN -35
19048	6:26052	NTIS, PC A03/MF A01. Order Number DE81025517, Distribution Category MN -38
19062	6:26627	NTIS, PC A02/MF A01. Distribution Category MN -32
19082	6:25086	NTIS, PC A07/MF A01. Order Number DE81026035, Distribution Category MN -91
UCRL-		
50027-80	6:26200	NTIS, PC A04/MF A01. Order Number DE81025124, Distribution Category STD -11
51444-80	6:26161	NTIS, PC A05/MF A01. Order Number DE81025120, Distribution Category STD -11
52981	6:26644	NTIS, PC A03/MF A01. Order Number DE81025122, Distribution Category STD -20f
53124	6:25941	NTIS, PC A02/MF A01. Order Number DE81025121, Distribution Category STD -25
53127	6:26420	NTIS, PC A02/MF A01. Order Number DE81025123, Distribution Category STD -11
53145	6:25174	NTIS, PC A03/MF A01. Order Number DE81025782, Distribution Category STD -15
84878	6:26162	NTIS, PC A03/MF A01. Order Number DE81023658, Distribution Category MN -41
85187	6:26099	NTIS, PC A03/MF A01. Order Number DE81024713, Distribution Category MN -45
85288	6:26615	NTIS, PC A02/MF A01. Order Number DE81024194, Distribution Category MN -34A
85298	6:26026	NTIS, PC A02/MF A01. Order Number DE81024258, Distribution Category MN -38
85312	6:25087	NTIS, PC A02/MF A01. Order Number DE81023662, Distribution Category MN -91
85458	6:25170	NTIS, PC A02/MF A01. Distribution Category MN -11
85460	6:25171	NTIS, PC A02/MF A01. Distribution Category MN -11
85604	6:26083	NTIS, PC A02/MF A01. Order Number DE81023155, Distribution Category MN -37
85653	6:26033	NTIS, PC A02/MF A01. Distribution Category MN -28
85655	6:26091	NTIS, PC A02/MF A01. Order Number DE81023059, Distribution Category MN -37
85673	6:26289	NTIS, PC A02/MF A01. Distribution Category MN -11
85744	6:25942	NTIS, PC A02/MF A01. Distribution Category MN -4
85754	6:26163	NTIS, PC A02/MF A01. Order Number DE81023666, Distribution Category MN -11
85826	6:26645	NTIS, PC A02/MF A01. Order Number DE81024415, Distribution Category MN -20
85902	6:25881	NTIS, PC A02/MF A01. Distribution Category MN -96
86041	6:26713	NTIS, PC A02/MF A01. Distribution Category MN -20a
86104	6:26729	NTIS, PC A02/MF A01. Order Number DE81024917, Distribution Category MN -37
86285	6:26092	NTIS, PC A02/MF A01. Order Number DE81024193, Distribution Category MN -37
86304	6:26714	NTIS, PC A02/MF A01. Order Number DE81025003, Distribution Category MN -13
UCRL-Trans-		
11679	6:25995	NTIS, PC A02/MF A01. Distribution Category MN -34
11689	6:26663	NTIS, PC A02/MF A01. Distribution Category MN -20f
UMTA-NC-		
06-0002-80-1	6:25756	NTIS. Distribution Category MN -98G
UR-		
3490-2024	6:26401	NTIS, PC A02/MF A01. Order Number DE81025192, Distribution Category MN -41
3490-2026	6:26392	NTIS, PC A02/MF A01. Order Number DE81024425, Distribution Category MN -41
UT/CES-PS-		
15	6:25073	NTIS, PC A07/MF A01. Order Number DE81903427, Distribution Category MN -98C
16	6:25728	NTIS, PC A04/MF A01. Order Number DE81903426, Distribution Category MN -95
WIPP-DOE-		
04	6:25144	NTIS, PC A03/MF A01. Order Number DE81023039, Distribution Category MN -70
05	6:25145	NTIS, PC A02/MF A01. Order Number DE81024993, Distribution Category MN -70
06	6:25146	NTIS, PC A02/MF A01. Order Number DE81024994, Distribution Category MN -70
24	6:25147	NTIS, PC A02/MF A01. Order Number DE81024995, Distribution Category MN -70
25	6:25148	NTIS, PC A02/MF A01. Order Number DE81024996, Distribution Category MN -70
35	6:25149	NTIS, PC A02/MF A01. Order Number DE81024997, Distribution Category MN -70
36	6:25150	NTIS, PC A02/MF A01. Order Number DE81024998, Distribution Category MN -70
37	6:25151	NTIS, PC A02/MF A01. Order Number DE81024999, Distribution Category MN -70
43	6:25162	NTIS, PC A02/MF A01. Order Number DE81023065, Distribution Category MN -70
74	6:25152	NTIS, PC A02/MF A01. Order Number DE81021959, Distribution Category MN -70
75	6:25153	NTIS, PC A02/MF A01. Order Number DE81023042, Distribution Category MN -70
76	6:25154	NTIS, PC A02/MF A01. Order Number DE81023181, Distribution Category MN -70
83	6:25155	NTIS, PC A02/MF A01. Order Number DE81023367, Distribution Category MN -70
84	6:25156	NTIS, PC A02/MF A01. Order Number DE81023366, Distribution Category MN -70
85	6:25157	NTIS, PC A02/MF A01. Order Number DE81023012, Distribution Category MN -70
86	6:25158	NTIS, PC A02/MF A01. Order Number DE81023003, Distribution Category MN -70
87	6:25159	NTIS, PC A02/MF A01. Order Number DE81023363, Distribution Category MN -70
Y-		
2244	6:25757	NTIS, PC A02/MF A01. Order Number DE81024942, Distribution Category STD -96
Y/DV-		
73	6:25916	NTIS, PC A02/MF A01. Order Number DE81024091, Distribution Category MN -25
74	6:25917	NTIS, PC A02/MF A01. Order Number DE81024092, Distribution Category MN -25

Report No.	*Abstract No.*	*Availability*
Y/DX-290	6:25883	NTIS, PC A02/MF A01. Distribution Category MN -94b

Abbreviations Used in Availability Column

Dep. DOE reports so designated are maintained in the organizations listed on the inside back cover.

EM Inquiries regarding the availability of blueline prints of DOE engineering drawings which were formerly available for sale by NTIS should be addressed to Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

ETEC Available *only to requesters within the United States* from the Energy Technology Engineering Center, P. O. Box 1449, Canoga Park, California 91304.

GJO Available from DOE Grand Junction Office, P. O. Box 2567, Grand Junction, Colorado 81501.

GPO For sale by the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.

NSO Available *only to requesters within the United States* from the Nuclear Standards Office, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, Tennessee 37830.

NTIS For sale by the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161. Price given is the domestic price for paper copy; prices for foreign purchasers are in most instances twice the domestic price.

TIC Available from the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

☆U.S. GOVERNMENT PRINTING OFFICE: 1981—740-143:11

NTIS NORTH AMERICAN PRICE CODES

Most NTIS products and services are now announced by price codes and, therefore, without specific prices in NTIS journals, newsletters and indexes.

The current dollar equivalent for each code is shown in the schedule below. Orders must list the accession number(s) and be accompanied by the total dollar amount from the current schedule.

NORTH AMERICAN CONTINENT PRICE SCHEDULE

Customers in Canada, U.S., and Mexico please use this price schedule; other addressees write for Folder PR-360-4.

A01.....$3.50	E01.....$5.50	T01..... $110.00
A02..... 5.00	E02..... 6.50	T02..... 125.00
A03..... 6.50	E03..... 8.50	T03..... 210.00
A04..... 8.00	E04.....10.50	T04..... 300.00
A05..... 9.50	E05.....12.50	T05..... 360.00
A06.....11.00	E06.....14.50	T06..... 420.00
A07.....12.50	E07.....16.50	T07..... 480.00
A08.....14.00	E08.....18.50	T08..... 540.00
A09.....15.50	E09.....20.50	T09..... 600.00
A10.....17.00	E10.....22.50	T10..... 660.00
A11.....18.50	E11.....24.50	T11..... 720.00
A12.....20.00	E12.....27.50	T12..... 780.00
A13.....21.50	E13.....30.50	T13..... 840.00
A14.....23.00	E14.....33.50	T14..... 900.00
A15.....24.50	E15.....36.50	T15..... 960.00
A16.....26.00	E16.....39.50	T16.....1,020.00
A17.....27.50	E17.....42.50	T17.....1,080.00
A18.....29.00	E18.....45.50	T18.....1,140.00
A19.....30.50	E19.....50.50	T19.....1,200.00
A20.....32.00	E20.....60.50	T99..... *
A21.....33.50	E99..... *	
A22.....35.00	N01.....30.00	
A23.....36.50	N02.....50.00	
A24.....38.00		
A25.....39.50	*Contact NTIS for price quote	
A99..... *		

PRICES EFFECTIVE JANUARY 1, 1981

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Cut out appropriate form and mail in a stamped envelope to the address indicated.

Change of Address Form

NAME—FIRST, LAST

COMPANY NAME OR ADDITIONAL ADDRESS LINE

STREET ADDRESS

CITY | STATE | ZIP CODE

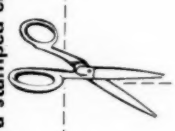
PLEASE PRINT OR TYPE

(or) COUNTRY

Mail this form to:

NEW ADDRESS
Superintendent of Documents
Government Printing Office SSOM
Washington, D.C. 20402

Attach last subscription label here.



Subscription Order Form

SUBSCRIPTION ORDER FORM

ENTER MY SUBSCRIPTION TO:

@ $ Domestic; @ $ Foreign.

NAME—FIRST, LAST

COMPANY NAME OR ADDITIONAL ADDRESS LINE

STREET ADDRESS

CITY | STATE | ZIP CODE

PLEASE PRINT OR TYPE

(or) COUNTRY

☐ Remittance Enclosed (Make checks payable to Superintendent of Documents)

☐ Charge to my Deposit Account No. .....

MAIL ORDER FORM TO:
Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

REPORT COLLECTIONS

The libraries listed below purchase and maintain microfiche collections of DOE and foreign reports. Most of these libraries have microfiche reader-printers or other photocopy facilities with which to reproduce enlarged copies from microfiche. Charges for reproduction services vary.

United States

ALABAMA
Auburn, Auburn University
ARIZONA
Tucson, University of Arizona
CALIFORNIA
Davis, University of California
Los Angeles, University of California
Santa Barbara, University of California
COLORADO
Boulder, University of Colorado
DISTRICT OF COLUMBIA
Washington, Library of Congress
FLORIDA
Gainesville, University of Florida
GEORGIA
Atlanta, Georgia Institute of Technology
HAWAII
Honolulu, University of Hawaii
IDAHO
Pocatello, Idaho State University
ILLINOIS
Urbana, University of Illinois
INDIANA
Lafayette, Purdue University
IOWA
Ames, Iowa State University
KANSAS
Manhattan, Kansas State University
KENTUCKY
Lexington, University of Kentucky
MARYLAND
Baltimore, Johns Hopkins University
College Park, University of Maryland
MASSACHUSETTS
Cambridge, Massachusetts Institute of Technology
Worcester, Worcester Polytechnic Institute
MICHIGAN
Ann Arbor, University of Michigan
MISSISSIPPI
Mississippi State, Mississippi State University
MISSOURI
Columbia, University of Missouri
Kansas City, Linda Hall Library
NEBRASKA
Lincoln, University of Nebraska
NEW JERSEY
Princeton, Princeton University
NEW MEXICO
Albuquerque, University of New Mexico
NEW YORK
Albany, New York State Library
Albany, State University at Albany
Ithaca, Cornell University
New York, Columbia University
Rochester, University of Rochester
Syracuse, Syracuse University
NORTH CAROLINA
Raleigh, North Carolina State University
OHIO
Cincinnati, University of Cincinnati
Cleveland, Cleveland Public Library
Toledo, University of Toledo
OKLAHOMA
Norman, University of Oklahoma
PENNSYLVANIA
Pittsburgh, Carnegie Library
PUERTO RICO
San Juan, University of Puerto Rico
SOUTH CAROLINA
Columbia, University of South Carolina
TEXAS
Austin, University of Texas
College Station, Texas A & M University
Houston, Rice University
UTAH
Salt Lake City, University of Utah
VIRGINIA
Charlottesville, University of Virginia
WASHINGTON
Pullman, Washington State University
Seattle, University of Washington
WEST VIRGINIA
Morgantown, West Virginia University
WISCONSIN
Madison, University of Wisconsin

International

EUROPEAN ATOMIC ENERGY COMMUNITY (EURATOM)
Brussels, Belgium
Ispra, Varese, Italy, Cetis Library
INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)
Vienna, Austria
OECD NUCLEAR ENERGY AGENCY (NEA)
British Library Lending Division
Boston Spa, Wetherby, Yorkshire, England

AVAILABILITY OF PUBLICATIONS ABSTRACTED

DOE reports are offered for sale by National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161. The availability of other reports, when known, is also indicated in the report number indexes. The availability of some unnumbered reports is given at the point of the citation.

For information on non-report documents such as journal articles, conference papers, books, and monographs the user should contact local, state, and university libraries or commercial reprint services.

Report Number Index
Contract Number Index
Subject Index
Author Index
Corporate Index